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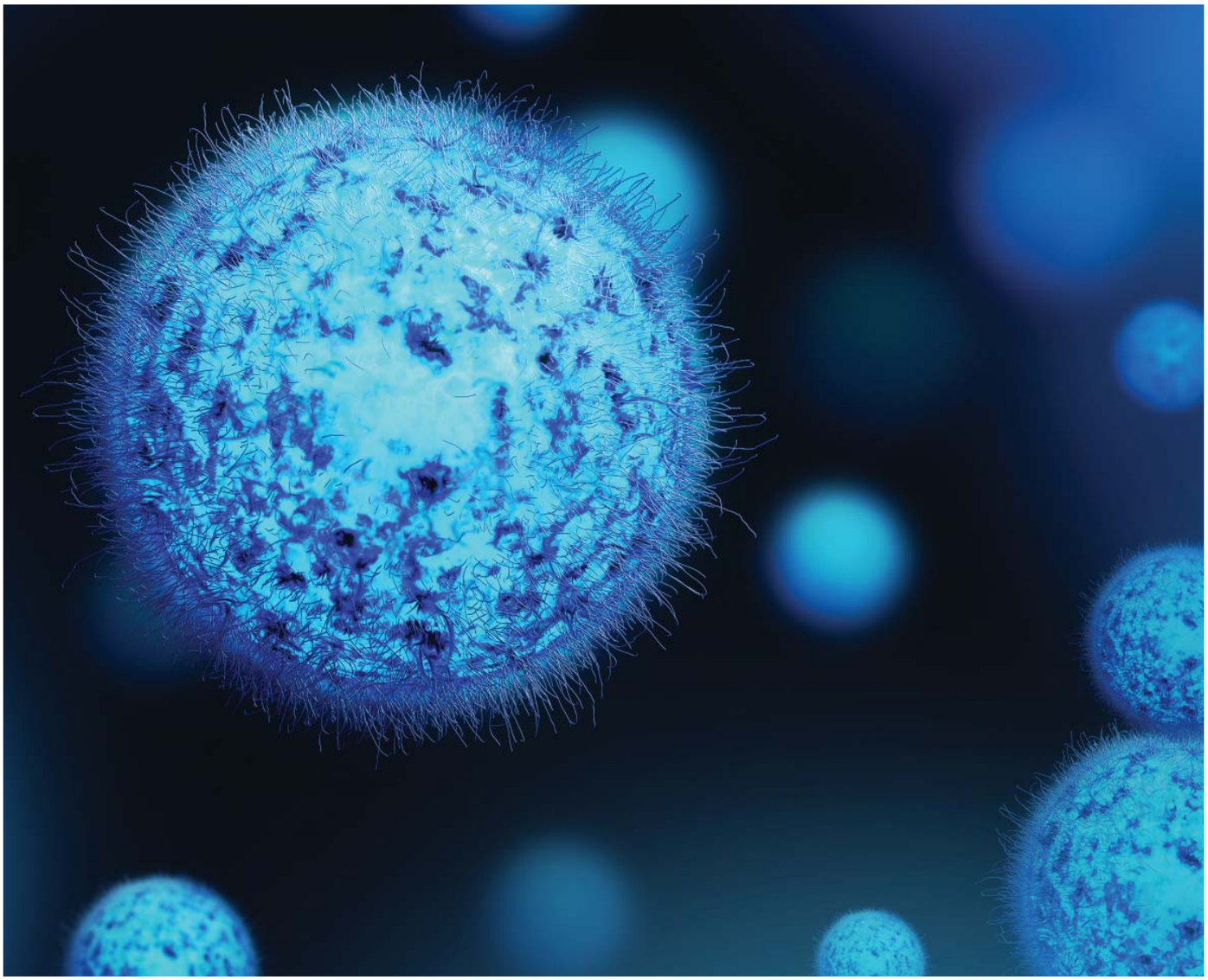

Infectious Diseases

History of Diseases

Immunity Debt

Antibiotics and the Microbiome

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The mission of The OJNA Journal is to

- Provide timely news and research updates
- Relay evidence-based research
- Share OJNA news and updates

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The Orthodox Jewish Nurses Association was founded in 2008 by Rivka Pomerantz, BSN, RN, IBCLC. It seeks to provide a forum to discuss professional issues related to Orthodox Jewish nurses and arrange social and educational events. We strive to meet the needs of our members, promote professionalism and career advancement, and be a voice for Orthodox Jewish nurses across the world.

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INFECTIOUS DISEASES

Editor's Note

Dear Readers,

We are all familiar with the leading causes of death in today's modern world, with heart disease, cancer, chronic respiratory diseases, stroke, Alzheimer's and diabetes topping the list. It is not until number 8 on the ignominious list that death from an infectious source—influenza and pneumonia—claws its way onto the list. Our current world, at least in first world countries, is at most risk from chronic and degenerative diseases.

This is in stark contrast to the historical leading causes of death when infectious diseases reigned supreme. In 1900, the leading causes of death included pneumonia, tuberculosis, and enteritis, which together with diphtheria accounted for a third of all deaths in the US, 40% of which were in young children. Even earlier, when people began moving from agrarian lifestyles to crowded city dwelling and when immigration was rising, outbreaks of yellow fever, influenza, cholera, dysentery, malaria, and typhoid fever were often the causes of morbidity and mortality. In addition to this dramatic shift in the causes of death, we also note a complete reversal in the demographics of the dying. Historically, deaths predominated in the infant and child populations; with so many succumbing to infectious diseases and accidents in their earlier years, most did not have the opportunity to develop life-threatening degenerative diseases. In even earlier times, diseases like the Plague (yersinia pestis) repeatedly wiped out large segments of the population. The ever present spector of malnutrition increased people's susceptibility to succumb to infectious agents.

There are many factors that influenced the striking shift from a world of premature death from communicable disease to our current world where it is expected that people grow old and where infectious diseases no longer ravage our population. A growing understanding of microbes marked the start of this changing world, and improvements in sanitation and hygiene, and the development of antimicrobial agents and vaccines in the last century have dramatically changed our relationships with infectious diseases and our thoughts about morbidity and mortality. How lucky we are to live in an era and in regions where getting the flu or a stomach bug does not fill us with terror and where we expect people to grow old.

While we may have become complacent in the matters of communicable diseases, the recent pandemic reminds us that microbes continue to evolve and will continue to interact with humans and emerge when we least expect it. The development of antibiotic resistant bacteria and the rise of "superbugs" is a challenge our generation may contend with, and there are those who worry that we may be moving into a "post-antibiotic era" where infectious diseases once again will flex their power and cause us to take note.

With this in mind, I invite you to read OJNA's winter journal on infectious diseases. Chevi Weinreb's feature provides a detailed historical context of infectious diseases to hopefully give us pause and remind us to be humble in the face of the infectious microbial world. Shevi Rosner reminds us of the risks associated with frequent antimicrobial use, and Sarah Bracha Cohen describes how we can protect ourselves from microbes at work. Toby Ash describes how infection with one agent has the ability to modify subsequent infections. Finally, enjoy articles on a wide range of topics that include the intersection of COVID-19 and HIV, the current RSV outbreak, the idea of fecal microbiota transplant, and more. Enjoy!

With blessings for a safe and healthy winter,
Chaya Milikowsky, MS, RN, AG/ACNP

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RESEARCH RECAP

By Ariella Belote and OJNA Staff Writers

Adult Vaccination as a Potential Protective Factor for Dementia

There is no question that vaccines have been controversial and questioned throughout recent years. "public health authorities have wanted to bust the myths surrounding vaccines, including the myth that links vaccines to the development of Alzheimer's disease. Alzheimer's, a form of dementia, is a disease that is identified by progressive cognitive decline that can affect all parts of life, including performing activities of daily living (ADL) [1]. Researchers have indeed discovered that common vaccines do have impacts on dementia risk—positive ones. The researchers of this study focused on investigating and identifying effects that may reduce dementia risk, as there are no therapies to reverse or cure dementia.

Dementia onset is often caused by the confluence of genes and environmental and lifestyle factors [1]. Modifying risk factors including hypertension, diabetes, alcohol consumption, smoking, air pollution, lack of physical activity, and more, may prevent or delay dementia by 40% [1]. Growing research also suggests that immune system and infections may be involved in dementia development, which can cause "neurotoxic inflammation and oxidative stress in the brain, which can lead to neurodegeneration" [1]. Therefore, vaccinations may have a positive effect in reducing dementia risk.

The researchers of this study performed a meta-analysis review on associations between vaccinations and dementia risk, including 17 studies and over 1.8 million participants. The vaccines evaluated with dementia risk included influenza; herpes zoster; tetanus, diphtheria, and pertussis (TDAP); bacillus Calmette-Guerin (BCG); pneumonia; poliomyelitis; hepatitis A; hepatitis B; typhoid; rabies; yellow fever; cholera; and meningitis vaccines [1]. From these studies, a 35% reduction in dementia risk after vaccinations was found [1]. The reduced risk did not vary on spectrums of ages, genders, or types of dementia [1]. The researchers noted that "the exact biological mechanism underlying the association between vaccination and reduced risk of dementia is unclear" [1]. However, it may correlate to vaccinations reducing the probability of developing infectious diseases, which can cause general inflammation affecting the brain [1]. The vaccines "may also enable the body's immune system to be trained and maintain appropriate immune responses, increasing ability to resist bacteria and viruses from entering the brain and reducing the risk of dementia caused by inflammation" [1]. In addition, in animal models, some vaccines such as influenza and BCG showed to enhance and maintain microglia activation, which restores brain immune homeostasis, ultimately improving cognitive impairment [1]. This illustrates that these vaccines may have preventative benefits by actually intervening "in the pathological process of dementia" [1].

Although evidence from these meta-analyzed studies do not show definitive dementia prevention from vaccines, the benefits of full vaccinations in adults are still substantial. Following routine immunizations may not only prevent vaccine-related diseases but may also prevent infections exacerbating existing chronic diseases in patients, lowering the risk of developing dementia. Limitations of this study include the small number of studies explored, the limited populations to specific conditions in some studies, and the type of vaccine used against the same pathogens across different timeframes and regions. Future studies and experiments may be needed to clarify the mechanisms of these associations, as well [1].

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Virus-infected Hosts Promote Mosquito Attractiveness

Different scents caused by certain viral infections may affect the attraction mosquitos have to people. In this study, researchers illustrated that fragrances released from skin microbiota of viral infected hosts facilitates mosquito attractiveness, enhancing viral transmission by mosquitoes [1].

Arboviruses, viruses that are transmitted by arthropods such as mosquitos, "naturally survive between hosts and arthropod vectors" [1]. Once arthropods locate a viremic host, feed on it, and acquire the infectious viral particles, the vector is virally infected and can spread the virus to other hosts it feeds on. This is how viruses and parasites may be transmitted through arthropods. However, this study demonstrated that a viral host may be more attractive to mosquitos, through scents released from their skin. Flaviviruses, viruses caused by vectors such as mosquitos, can "promote the proliferation of acetophenone-producing skin commensal bacteria by suppressing the expression of the essential antimicrobial protein called RELMA. The results demonstrate these viruses can manipulate host skin microbiota to produce mosquito attractants and facilitate transmission" [1].

In this study, Zika (ZIKV) and dengue fever (DF) viruses were studied using mice participants. The researchers conducted the study with two groups: one involving mice artificially-infected with ZIKV against a control of uninfected mice, and another with artificially-infected with DF, against a control of uninfected mice. With the knowledge that several cues may influence mosquito behavior such as heat, carbon dioxide, and odor emission, the researchers manipulated these measures in their study. The results found that the mosquitos drawn to mice with high body temperatures was the same as those to the control mice, thereby excluding body temperature as an essential host cue for mosquitoes' host-seeking behavior in this experimental setting. The same was done for amounts of carbon dioxide in their environment. The researchers found that the ratio of mosquitos seeking infected and uninfected mice were comparable, but preferred to feed off the infected mice over the uninfected mice, indicating that the odorants from the infected mice determined mosquitoes' behavioral preferences [1].

Furthermore, the researchers assessed the role of human odors in mosquito attractiveness by recruiting DF patients and healthy volunteers and collecting odorant blends from their armpits. The extracts from DF patients presented a higher mosquito attraction than those from healthy donors. This illustrates that DF manipulates the skin microbiome of hosts, thereby enhancing the release of skin odor cues and attractiveness for mosquitos.

Altogether, the studies suggest that "the skin microbiota plays an important role in the transmission of viral pathogens" [1]. However, limits to this study included the limited data extracted due to primarily using a mouse model—the physiology of mice and their skin are different from human skin and therefore, the possibility of other bacterial populations in human skin (rather than that of the bacterial population identified in this study), cannot be excluded. The researchers noted that the next step to further this study would be to analyze "more human patients with DF and ZIKV to see if the skin odor-microbiome connection is generally true in real world conditions" [2].

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RESEARCH RECAP

Potential Tuberculosis Blood Test

According to the World Health Organization (WHO), tuberculosis is the second leading infectious cause of death worldwide and identifying active tuberculosis (TB) infection is usually done by testing sputum with three consecutive tests performed 8-24 hours apart. Sputum can be obtained spontaneously, induced, or via bronchoscopy. This testing can be cumbersome, and in immunocompromised hosts with extrapulmonary manifestations of tuberculosis, there may be minimal sputum with enough bacteria to generate accurate results. This could lead to false negative results and delay treatment [1].

Clustered Regularly Interspaced Short Palindromic Repeats technology, otherwise known as CRISPR technology, is a genome editing technology that allows scientists to create cell and animal models to accelerate disease research. This DNA technology may now help with early detection of tuberculosis in adults and children, including children with human immunodeficiency virus (HIV). In this study, researchers tried to determine whether ultrasensitive detection of Mtb-cfDNA, the CRISPR DNA name for tuberculosis (TB), in serum can diagnose TB and evaluate TB treatment responses [2].

Researchers enrolled participants from Eswatini and Kenya, Africa, from September 2020 to June 2021. These participants were adults and children with microbiologically confirmed or presumed TB based on clinical presentation and TB inclusion criteria as identified by the National Institutes of Health (NIH), in addition to their asymptomatic household members, and a cohort of children living with HIV that were symptomatic and immunocompromised. Cryopreserved serum was collected from these cohorts, and CRISPR-TB diagnostics were performed if the individuals had sufficient serum and clear clinical diagnostic results [2]. CRISPR technology was then used to analyze the extracted DNA. The CRISPR-TB detection "was higher in adults and children with microbiologically confirmed TB, and adults with clinically diagnosed TB, than their asymptomatic controls" [2]. The technology identified adult TB with a 96% sensitivity (27 out of 28 adults) and a 94% specificity (16 out of 17 adults); it identified pediatric TB with an 83% sensitivity (5 out of 6 children) and 95% specificity (21 out of 22 children) [2].

There were 153 serum samples collected from children that were HIV positive, who were at high risk for TB and presented with at least one symptom of the disease. CRISPR-TB identified and confirmed all 13 TB cases and almost 85% of unconfirmed TB cases (52 out of 65 children) [2]. It also detected Mtb-cfDNA in blood collected from HIV patients weeks before their confirmed diagnosis, demonstrating the technology can likely be used for early diagnosis and detection of TB [2].

Furthermore, the researchers presented data illustrating serum concentrations of Mtb-cfDNA decreasing quickly following treatment initiation for tuberculosis, suggesting this technology can be used to monitor TB treatment [2].

In conclusion, the findings from this study illustrate strong evidence for utilizing CRISPR technology in diagnosing tuberculosis and TB treatment monitoring, in addition to early TB diagnosis and detection in children at higher risk of TB infection and TB-related mortality [2].

Limits to this study included the use of cryopreserved serum, which may have influenced the concentration of cfDNA. Additionally, pediatric TB diagnoses were made primarily without microbiological confirmation [2].

Since the publication of this study, the researchers have adapted the method to a rapid test platform "that can deliver results in 30 minutes without any special equipment," with results that may be viewed on a paper strip [1].

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Updated TDaP Approval for 3rd Trimester of Pregnancy

Until recently infants, who are at the greatest risk of both contracting pertussis and of developing complications from pertussis, remained unprotected until they turned two months old. That is the age at which the DTaP vaccine, which combines vaccines for diphtheria, tetanus, and pertussis, is first given to infants. According to the Centers for Disease Control and Prevention (CDC), of the cases of pertussis that occur annually in infants younger than 6 months old, 31% require hospitalization.

Before the pertussis vaccination became widespread, there were an average of 200,000 annual cases of pertussis infection, however since the 1940s when the pertussis vaccination became available, the incidence dropped by 75% [1].

The most prominent feature of pertussis infection is a whooping cough, which describes the sound an infected child makes when gasping for breath after a paroxysm of coughing. Prior to reaching the stage of excessive coughing, a child in the earlier stages of pertussis infection may show signs of low grade fever and upper respiratory inflammation with mucus production. When treated with antibiotics in this earlier stage, it can help reduce the severity of symptoms. Antibiotics will not modify symptoms if given later in the disease course. In that later stage with paroxysms of whooping cough, complications include hypoxia, apnea, pneumonia, and death in 1% of hospitalized infants [1].

CDC data shows that pertussis in infants under 2 months can be prevented when the mother obtains the TDaP vaccine in her 3rd trimester of pregnancy. On October 7th, 2022, the U.S. Food and Drug Administration (FDA) approved the Boostrix (Tdap) vaccine for administration to women in their 3rd trimester of pregnancy specifically for the purpose of protecting the unborn child until it is old enough to receive its own series of the DTaP vaccine [2]. In the past, Boostrix has been approved for pregnant women for their own protection from these diseases, and it has been recommended for pregnant women since 2012. This updated recommendation is based upon a repeat analysis of previous Boostrix data in which analysis of 291 infants estimated effectiveness of the 3rd trimester vaccine as 78% effective in preventing pertussis in infants younger than 2 months old. No vaccine associated adverse events were noted in the pregnant mother or to the infant [2].

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The Incurable Relationship Between Humans and Infectious Diseases

By Chevi Weinreb, MSN, RN, OCN and Chaya Milikowsky, MS, RN, AG/ACNP | *Staff Writers*

The History of Infectious Diseases

To speak of the history of infectious disease is to speak of the history of humankind. The story of each is entangled and inseparable from the other. Going as far back as ancient and biblical times, the rise and fall of civilizations and determinants of conflict have often been, at least partially, attributed to plagues and disease. Infectious diseases have had "…significant social, economic, political, and cultural ramifications throughout history" [1]. Infectious diseases are illnesses caused by microbes that have been in existence since the creation of the world. Every shift in human society, agriculture, science, and technology creates a never ending dance of new opportunities for microbes; new trade routes equal new routes of contagion; agrarian society opens new avenues of exposure [2]. Further entwining this complicated relationship are those attempting to treat, heal, or control disease. At times, human triumph over disease simultaneously fosters the emergence of stronger, more efficient and evasive microbes.

In the opportunistic microbial world, there is the constant possibility of something new evolving, just as humans constantly evolve and develop. Advances in science and an understanding of the microbial world and epidemiology have brought great changes to how disease is thought of and treated. It would seem much would have changed over the course of centuries, yet there is still much that has remained the same.

Modern medicine's approach to infectious disease is based on the understanding that infectious diseases are illnesses caused by microbes, such as bacteria, viruses, parasites, and fungi, which can make their way into the body and cause infection. Some infectious diseases are communicable and spread from person to person, some are acquired from the air, water, or soil, and some may be carried by animals or a vector (e.g., biting insect). This 'Germ Theory' has only been popular and accepted fairly recently, over the last few centuries. For those interested in understanding the history of diseases going back further than recent history, there is the relatively new discipline of paleopathology which is the study of ancient diseases. Much of the focus of paleopathology arises from the premise that understanding the history and evolution of infectious diseases will contribute to developments in treatment and aid in predicting the course of current diseases. One of the perplexing aspects of paleopathology is lack of reliable sources. In ancient accounts of the emergence and spread of infectious diseases, descriptions are often vague. Sources include ancient texts (such as the Torah—both the written and oral law), ancient art, and archeology. All have provided clues to infectious diseases prevalent in antiquity, however, it can be challenging to obtain definitive epidemiologic evidence. Often, opinions and theories abound [1].

Millennia ago, life expectancy was low. While today's mortality rates are often associated with diseases of old age such as heart disease, diabetes and cancer, in the past, the death toll was highest among children and young adults. Infection and communicable diseases were the leading causes of death. The large majority of children, about 50%, did not survive to the age of 10, and 25% died as infants [3]. Other than childbirth and trauma, cholera, typhus, diphtheria, tuberculosis, influenza, malaria, measles, and mumps were most likely among the common causes. Access to clean, safe drinking water, adequate sanitation, and antibiotics have made these unlikely causes of death in the modern world, though they continue to remain prevalent in indigent, poverty-stricken areas of the world [1].

Earliest accounts of infectious diseases were usually those of pandemic proportions worthy of a note in history. Initially, evidence points to dissemination and contagion along major trade routes, such as the Silk Road, a network of routes used for trade between Asia and the Western world dating back to 130 B.C.E. until the 15th century C.E. [4], and military routes during conflict and foreign invasions. From there it follows the movement of populations as society modernizes. Advances in travel and increased human contact with animals by trade and animal-based foods continued to accelerate and expand the scope and spread of pandemics [1, 2]. One of the first plagues of epidemic proportions was recorded by Thucydides in Athens in 430 B.C.E. during the Peloponnesian War. It is unclear which pathogen was the cause, but some think it may have been Ebola [1], typhoid fever, or even measles [5]. Regardless of the epidemiology, it was likely the deciding factor in the conflict. The description of the next 'great' plague was documented by the famous physician, Galen, during the rule of Marcus Aurelius Antoninus in 166 C.E. and is often accounted as the beginning of the decline and fall of the Roman Empire. Another plague described by the bishop Cyprian in the mid-3rd century also rocked the Roman Empire. The disease was likely carried by soldiers [6]. The Justinian Plague, 541 C.E., was the first to be ascribed to what we now know as the bacterium Yersinia pestis, the pathogenic cause of bubonic, septicemic, and pneumonic plague. It traveled along the ancient Silk Road, but also with military supply trains carrying infected rats. Yersinia pestis is what we think of when the word plague is used. It was the cause of the Black Death that raged throughout Europe in the mid-14th century—the plague associated with the famous bird beak masks. Those masks were thought to protect the wearers from miasma, or bad air, which carried the disease. In reality, the disease was carried by fleas and rodent vectors. The Black Plague decimated approximately half of the European population [2].

Prior to the move to agrarian societies, when humanity lived in small isolated groups, the causes of disease were likely

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different pathogens than those spread in densely populated areas. Dense population and interaction with domesticated animals supported the spread of communicable diseases like smallpox, influenza, measles, and cholera, pathogens that move quickly through their hosts with a high rate of mortality. Therefore death by microbes in earlier times was more plausibly attributed to vector-borne diseases such as malaria and other parasites [7].

Smallpox, another ancient disease, may have been around as early as 1500s B.C.E. Egyptian mummies carry evidence of what could possibly be smallpox lesions. The first reliable descriptions of smallpox appeared in China in the 3rd century [8]. Smallpox killed nearly three out of 10 who contracted it and left survivors scarred. It spread throughout Asia, then India and Asia Minor as trade routes opened, eventually making its way to Europe, Africa, and North America. Smallpox is notable as the first disease to be treated prophylactically by variolation and the beginning of vaccination.

It is clear that humans and microbes share an intertwined and complicated history. Conflicts, and the rise and fall of civilizations, have been determined by infectious diseases both due to population outbreaks as well as individual afflictions. The Plague of Athens, though no consensus exists for the etiology of this plague, altered the balance of power between Athens and Sparta. The Justinian plague in large part contributed to the downfall of the Greek and Roman empires. New diseases carried by explorers and conquering societies decimated large parts of the native New World populations, allowing colonizers to take over. But the effects wrought by individual encounters with disease are at times no less dramatic. For example, Alexander the Great died at the age of 33 from a suspected communicable disease (else he was poisoned); who knows how different our world would be had he lived to continue to change the military and cultural tapestry of civilization [9].

Yet it is a two way street, with humans continuing to exert changes on pathogens that subsequently circle back to affect human populations. Climate changes and population increase destabilize the environment and contribute to the spread of diseases such as Zika, West Nile Virus, Chikungunya, Dengue, and Lyme disease [10].

Theories of Disease

From the earliest recorded history, disease was often associated with divine retribution. In many cultures, disease was seen as punishment for angering the gods or God, or due to demonic possession. The Greeks dismissed a divine concept of disease, and Hippocrates, in the 5th century B.C.E., associated disease with an imbalance within the body, and more specifically to an imbalance between the four humors of melancholy (black bile), phlegm, blood, and yellow bile. The humoral theory spread beyond Europe to India, China, and Egypt. The Greeks also developed the theory that 'bad air,' or 'miasma,' was the source for disease [11].

Miasma theory believed disease to arise from poisonous vapors, especially those that rise from low-lying, swampy areas. This theory of disease became the predominant theory around the world, especially in the middle ages, and it persisted long into the 19th century in Victorian England [12].

However, even while Miasma theory was being used to describe the outbreaks of diseases and even earlier in ancient cultures, a recognition of contagion already existed. In many ancient cultures, infected individuals were separated from the community and concepts regarding the separation of Clean and Unclean existed. During pandemics of the Plague, closing off ports, cordoning off trade routes, and separating healthy from infected individuals was carried out [2]. Girolamo Fracastoro, an Italian physician in the 16th century, described the spread of diseases by 'seminaria' or 'imperceptible particles' that could be transmitted through direct contact, through fomites, or through the air [13]. But without the confirmation of such particles that would come from the invention of the microscope, and without the understanding that those particles are what cause disease, this idea was not appreciated, and the Miasma theory dominated well into the 19th century. Miasma theory was helpful in encouraging improvements in sanitation and hygiene since it was pretty apparent that diseases like cholera were more likely in areas with lots of foul smells because of decaying organic matter. But it was not until the 1850s that physician John Snow was able to prove that cholera erupted, not from bad air, but from fecal germs in the water system.

Perhaps the biggest change in how the source and cause of disease was viewed was due to the discovery and confirmation of the existence of microorganisms in the mid-17th century with the invention of the microscope by Hooke and van Leeuwenhoek [14]. In addition to being a microscopist, Leeuwenhoek disproved the idea of spontaneous generation and showed that creatures like maggots and fleas hatched from eggs, and most importantly, he was the first to describe microscopic lifeforms, calling them (protozoa, and eventually bacteria) "animalcules".

Ultimately, it was Louis Pasteur in the 1860s who concretized the germ theory of disease after demonstrating the presence of bacteria in the air. Robert Koch identified a bacterium as the cause of anthrax in 1977, and then in rapid succession, microbe after microbe was identified. The miasma theory of disease was finally laid to rest alongside the humoral and supernatural theories, and the earlier ideas of contagion and spontaneous generation [11].

Response to Infectious Disease

Consistently evolving, the prophylactic approach to infectious diseases has eradicated some of them (e.g., smallpox) or relegated them to endemicity in certain regions—usually areas associated with poverty and lack of access to safe clean water and adequate sanitation.

To put things in perspective of this vast history of humans seeking to escape plagues and pestilence, it was only in the 20th century that routine vaccination was introduced as a method to control disease in large populations. Other than clean drinking water and effective sanitation, not even antibiotics have been as effective an intervention at reducing mortality [15]. So, despite the current controversy and emotion surrounding vaccines, a discussion about the history of infectious diseases would not be complete without some discussion of the history of vaccines. And regardless of the current controversy surrounding specific vaccines, certain facts cannot be disputed.

Vaccines are the 'holy grail' of the infectious disease world because, as Benjamin Franklin famously said, "An ounce of prevention is worth a pound of cure." The most talented doctor or surgeon using the most advanced techniques and treatments, cannot hope to

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save more than a small fraction of the lives saved by a single vaccine.

Although Edward Jenner is credited with the first vaccine (against smallpox) in 1796, inoculation in the form of variolation, deliberate exposure to a source of infection, is talked about as early as the 10th century in China and the 16th century in India. There is even earlier documentation of the idea of introducing that which makes you sick into the body in an attempt to gain immunity. Some Indian Buddhists in the 7th century recorded an attempt at drinking snake venom in order to become immune to its poisonous effect and may have achieved some kind of antitoxin immunity.

Variolation in the early 1700s paved the way to important advances in the science of inoculation. You might say this was the beginning of 'evidence-based practice'. Variolation can be traced back to the Ottoman Empire where it was common practice for quite some time before the practice was brought from Turkey to England, but 2-3% of those variolated with smallpox died of the infection.

This dance with microbes is the past, present, and future of humankind. It was generations before infectious diseases and epidemiology were studied as a science. Yet, despite considerable advancement in understanding of the microbial world and the ability to manipulate it, microbes continue to evolve and evade annihilation. It is indeed humbling to acknowledge something so tiny as to not be seen with the naked eye has changed us, will continue to change us, and has undeniably altered the course of world history and humanity as a whole.

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At the Intersection of Two Pandemics: The Impact of COVID-19 on HIV

By Estie Mermelstein, MSN, FNP-BC | *Staff Writer*

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Worldwide, there are currently 38 million people living with human immunodeficiency virus (HIV) (PLHIV) [1]. The decades-long fight against HIV has overcome several hurdles, and its latest challenge is the concurrent COVID-19 pandemic.

The intersection of these two pandemics has led to disruptions in HIV services, accelerated the debut of telehealth into HIV care, and highlighted the vulnerability of Black/African American and Hispanic/Latino communities, which are populations at high risk for both HIV and COVID-19. A body of emerging research has resulted in an attempt to quantify these changes and predict the new trajectory of the HIV pandemic.

Disruptions to HIV Care

Government-mandated lockdowns, necessary to prevent the spread of COVID-19, have had wide-ranging effects on the delivery of healthcare. Around the world, PLHIV received fewer tests and had less access to treatment [2,3].

Data collected by the Joint United Nations Programme on HIV/AIDS (acquired immunodeficiency syndrome) (UNAIDS) from March to September 2020 showed widespread declines in the numbers of patients initiating HIV treatment as well as declines in HIV testing [1]. In addition, of 13 countries reporting sufficient monthly data, six had 25% or greater decreases in the number of pregnant women tested for HIV, and five out of 10 countries had a 25% or greater decrease in the number of pregnant women initiated on antiretroviral therapy (ART). Although some of these declines were sharp and short lived, others persisted through September 2020 [1].

A cohort study published in *The Lancet HIV* of 455 HIV-negative pregnant women in Cape Town, South Africa, evaluated the effect of a national COVID-19 lockdown on antenatal visits and pre-exposure prophylaxis (PrEP) prescriptions. The women were screened for PrEP eligibility at their first antenatal visit, and 91% opted to start PrEP. Overall, 34% of women missed their PrEP visits before the lockdown, and 57% missed their PrEP visits during the lockdown [2].

"Frequent clinic visits were challenging for women before the lockdown," noted Dvora Joseph Davey, PhD, lead author of the study, "especially in the postpartum period." Women cited time and travel constraints, and some did not understand why they needed to continue PrEP after giving birth.

"But the proportion of women who reported those reasons increased significantly with the [COVID-19] lockdown. The health facility was perceived as a risky place to go, especially with a newborn baby," said Davey. Before the pandemic, "no one ever expressed fear of coming into the clinic"; however, COVID-19 has created a fear of coming into the clinic that still persists, she added.

To address this fear, Davey and her team adapted their protocols. They switched lengthy health interviews to phone interviews, gave multi-month PrEP prescriptions, and applied a differentiated care model that delivered HIV testing and treatment outside the health clinic

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and into the community. "I think all of those things—differentiated care, shortened visits, multi-month prescriptions—should be continued even outside of a pandemic," Davey emphasized.

Supply chains for ART were disrupted by COVID-19, according to a survey conducted by the European AIDS Treatment Group in late April 2020 and early May 2020. The survey also found that PLHIV were asked to switch their treatment regimens to prioritize certain ART combinations for COVID-19 treatment instead. Some countries suspended voluntary medical male circumcision programs from April 2020 to June 2020 to focus on essential health services, and others suspended male and female condom programs, as well [1].

Yet despite the obstacles posed by COVID-19 measures, many countries were able to maintain patient access to ART long term. Among 25 countries reporting sufficient monthly data to UNAIDS, only six reported a sustained decline in the total number of PLHIV receiving ART as of April 2020 [1]. Declining numbers in testing and PrEP or ART initiation were not solely due to restricted access. Changes in sexual practices from less socialization during the COVID-19 lockdown obviated some of the need for HIV services [4].

A study published in *The Lancet HIV* conducted among 364 patients at the Melbourne Sexual Health Centre found that the number of postexposure prophylaxis (PEP) prescriptions decreased by 66% during four weeks of a COVID-19 lockdown compared with the four weeks before the lockdown. The study authors noted that this decrease was likely due to reduced sexual risk instead of reduced access because the health center remained open and accessible throughout the lockdown [5].

Anthony Fauci, MD, director of the National Institute of Allergy and Infectious Diseases at the National Institutes of Health, co-authored an article published in April 2021, "HIV/AIDS in the Era of COVID-19: A Juxtaposition of 2 Pandemics," which outlined the effects that COVID-19 has had on the HIV pandemic [6]. "There was a disruption in the normal behavior of life when people living with HIV were dealing with a pandemic that was threatening to kill them," Fauci said in an interview.

Telehealth: The New Face of HIV Care?

Telehealth was difficult to implement before the COVID-19 pandemic because of numerous regulations. Patients had to live in designated rural or medically underserved areas, only certain providers could bill for telehealth visits, and patients could not join telehealth visits from their homes but needed to travel to an approved location to connect with a visit. Private insurance payors restricted reimbursement, cost sharing, and prescription refills for telehealth visits [7].

Yet telehealth has emerged as a way to avoid HIV care disruptions due to COVID-19 measures. In March 2020, the Department of Health and Human Services (DHHS) and the Centers for Medicare and Medicaid Services enacted several emergency waivers to lift restrictions on telehealth [8]. The DHHS now recommends telephone or virtual visits for routine, non-urgent HIV care and counseling instead of in-person encounters [8]. In February 2020, 0.1% of Medicare visits were done via telehealth; in April 2020, 43.5% of Medicare visits were conducted via telehealth [7].

There were conflicting data from studies on HIV telehealth during the COVID-19 pandemic. Some studies reported higher patient engagement [9], while others reported more patients lost to follow-up [10].

Issues with HIV telehealth exist, including concerns about quality of care, privacy, reimbursement, cost, medicolegal risks, and a diminished personal connection between patient and provider. A very prominent issue is the "digital divide" that separates HIV patients along socioeconomic lines: those with access to adequate technology and those without [7]. Yet most PLHIV and providers in these studies reported positive attitudes toward telehealth, citing the ability to avoid both travel and the fear of stigma with in-person HIV clinic visits.

Davey and her team in South Africa found that health interviews via telephone were "pretty effective at shortening visits and shortening contact in terms of the pandemic."

She is preparing to publish a study on the role of stigma in HIV care for women in South Africa.

"A big issue [among women in the study] is the fear of even talking with their partner about HIV," said Davey. Since HIV is hyperendemic in South Africa, "PrEP is a way to protect them and their infant from getting HIV," Davey explained. "That stigma of seeking PrEP is still a problem."

Therefore, telehealth will likely continue to be a mainstay of HIV care, and further study of the issues mentioned here will be necessary in the approaching era of post-COVID-19 HIV care [7].

Black/African American and Hispanic/Latino Populations

Individuals in Black/African American and Hispanic/Latino communities have higher rates of HIV [6], COVID-19 infections, and worse COVID-19 clinical outcomes [11], warranting special attention during the intersection of the two pandemics. Yet does HIV predispose these individuals to COVID-19 infection and worse clinical outcomes, or not?

A systematic review of 25 studies published in *AIDS and Behavior* found that coinfection with HIV is not a risk factor for COVID-19 [12]. Regarding COVID-19 clinical outcomes, the research is mixed. Some studies reported a significant difference in the severity of COVID-19 infection in PLHIV [11]. However, the largest U.S. cohort-based study of COVID-19 patients with and without HIV found similar rates of SARS-CoV-2 infection, hospitalization, intensive care unit admission, intubation, and death between both cohorts [6].

"Not every person living with HIV is the same," noted Fauci. "There are some persons living with HIV who are on [ART], they have normal CD4 counts, and they have a virus that is below detectable levels; their risk of getting a severe outcome of SARS-CoV-2 is very, very low."

A number of studies indicate that HIV-associated comorbidities, rather than HIV itself, puts PLHIV at risk for worse COVID-19 outcomes. These include certain cancers, chronic kidney disease, chronic obstructive pulmonary disease, certain cardiovascular diseases, obesity, and type 2 diabetes [6].

"If you look at all HIV-infected people, all other things being equal, the fact that someone has a greater likelihood of getting a severe outcome is mostly related to the fact that they have more of an incidence of the underlying conditions leading to a more serious COVID-19 outcome," Fauci continued.

All of these comorbidities are also risk factors for severe COVID-19 in the general population [13] and are particularly common among Black/African American and Hispanic/Latino communities. These conditions, rather than HIV, may predispose

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Black/African American and Hispanic/Latino PLHIV to severe COVID-19 infection outcomes [6].

Yet disruptions in HIV care during the COVID-19 pandemic increased the disease burden of Black/African American and Hispanic/Latino PLHIV. A survey of 2732 men who have sex with men and other gay men, the results of which were published in *AIDS and Behavior,* found that those who identified as racial or ethnic minorities vs those who did not felt less definite in their ability to access condoms (62% vs 68%; P <.001) and HIV self-tests (17% vs 20%; P =.03), and more difficulty accessing or refilling ART prescriptions (25% vs 15%; P =.004) as a result of the COVID-19 pandemic [14].

"Black and Hispanic people generally have essential jobs that put them into direct contact with other people," explained Fauci. "Therefore, they have a greater likelihood of being exposed to SARS-CoV-2."

Progress in the HIV Pandemic

Will COVID-19 stall progress in the fight against HIV/AIDS? Projections from UNAIDS show that COVID-19-related disruptions in HIV care may lead to 123,000 to 293,000 additional HIV infections and 69,000 to 148,000 additional AIDS-related deaths globally from 2020 to 2022 [1]. About 26 million people were on ART as of mid-June 2020, reflecting only a 2.4% increase from the end of 2019, compared with a 4.8% treatment coverage increase from January 2019 to June 2019 [1].

A modeling study published in *The Lancet HIV* found that a six-month interruption in the ART supply to 50% of PLHIV in sub-Saharan Africa could result in a 1.63 (range, 1.39-1.87) times increase in HIV-related deaths over a one-year period compared with no disruptions, yielding 296,000 (range, 229,023-420,000) excess deaths [15]. Disruptions of various HIV services due to COVID-19-prevention programs, testing, treatment, and care could lead to an increase in deaths from HIV, tuberculosis, and malaria [15].

"You have everything from a lack of services for the prevention to a lack of implementation of the interventions such as PEP, PrEP, and treatment," said Fauci. "When you don't treat people who are infected, you don't get the viral load below detectable levels; they wind up infecting other people, and you have a propagation of the outbreak."

There is a bright side, however. With large-scale COVID-19 vaccination, UNAIDS projects that HIV services will rebound quickly, and the COVID-19 pandemic's effect on the HIV pandemic will be relatively short lived [1].

Therefore, UNAIDS developed new targets for 2025 in order to achieve their 2030 goal of 90% reduction in annual HIV infections and AIDS-related deaths. The 2025 targets focus on providing a core combination of HIV services, including multiple HIV prevention options, HIV testing, ART, and support for achieving and sustaining viral suppression [1].

Going forward, Fauci feels that investing in science and research is the highest priority for staving off future pandemics and ending the current ones. "It was decades of investment in science—both clinical, preclinical, and basic science—which led to the development of highly successful, highly effective, and very safe vaccines," he pointed out. "The greatest argument for investment in biomedical research is the fact that we've been able to very expeditiously develop effective vaccines for SARS-CoV-2," Fauci concluded.

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Respiratory Syncytial Virus

By Scott Topiol, MSN, RN, CEN, PHN, MICN

Whether you work in a pediatric clinic, an emergency department, or simply know a parent with a young child, there is no escaping the current outbreak of respiratory syncytial virus, better known as RSV. This virus is the most common cause of lower respiratory infections in children less than one year, but can cause serious respiratory illness in anyone. Virtually all children will have been infected with RSV by two years of age [1].

RSV is a highly contagious virus that is spread through exposure of mucous membranes (e.g., mouth, nose) to virus-containing respiratory secretions. Transmission is also possible through direct contact with contaminated fomites (e.g., doorknobs, countertops, toys) as well as from direct exposure to large droplet aerosols. It has an incubation period of about four to six days.

In the Northern Hemisphere, outbreaks usually begin in October or November, peak in January or February, and decrease by April or May. This timing is essentially reversed in the Southern Hemisphere with the start of RSV season occurring in May or June and ending by October.

According to the Centers for Disease Control and Prevention (CDC), this single-stranded RNA virus is responsible for some 2.1 million outpatient visits among children under the age of five each year in the United States. Of those, about 70,000 will require hospitalization and approximately 200 will die. RSV is also responsible for approximately 100,000 hospitalizations and as many as 10,000 deaths each year among people aged 65 years and older [2].

RSV and COVID-19

While a predictable seasonal pattern is true most years, widespread COVID-19 mitigation measures are believed to have played a role in recent RSV outbreaks. Infection control practices such as masking, stay-at-home orders, physical distancing, and the closure of schools resulted in a sharp reduction of typical case counts [3]. Easing of these restrictions led to large numbers of people rapidly being exposed to the virus, resulting in outbreaks occurring outside of the normal seasonal pattern [4]. There is also a growing body of evidence to suggest that COVID-19 prevention strategies may have contributed to the development of RSV immunity debt. Simply stated, immunity debt is defined as the lack of immune stimulation and protective immunity because of reduced exposure to a given pathogen [5,6]. This resultant immunity debt may contribute to the increased severity of recent outbreaks.

Risk Factors

Most RSV infections are limited to the upper respiratory tract and are generally mild. However, certain risk factors can increase the likelihood of severe disease. These risk factors include [7]:

- Infants under six months of age
- Infants born prematurely (before 35 weeks gestation)
- Infants and children with congenital heart disease
- Down syndrome
- Immunocompromise
- Persistent asthma (any age)
- Adults with cardiac or pulmonary disease
- Chronic lung disease (e.g., cystic fibrosis, bronchopulmonary dysplasia)
- History of allogenic hematopoietic cell transplantation (significant fatality risk)

Prevention

There is no vaccine for RSV. As the virus is primarily spread through direct contact with infected respiratory secretions, good hand hygiene is the most effective prevention measure. Children and adults should be educated on proper cough hygiene, which includes covering one's cough with a tissue or coughing into the upper sleeve and not directly into hands. RSV can live on surfaces for several hours, so care should be taken to routinely disinfect high-contact surfaces such as doorknobs, crib rails, and toys. Droplet precautions are appropriate when direct exposure to large droplet aerosols may occur. High-risk individuals should avoid contact with those known to have symptoms of respiratory illness.

Palivizumab

Palivizumab is a monoclonal antibody that can be administered to high-risk children under two years of age for RSV prophylaxis, especially those born prematurely or who have underlying lung disease. Palivizumab does not treat RSV once symptoms develop but may be given to at-risk individuals when the likelihood of exposure is high (e.g., symptomatic sibling, high community incidence). It is administered as an intramuscular injection at a dose of 15 mg/kg once per month for a maximum of five doses during the RSV season. In trials, palivizumab was shown to reduce the RSV-related hospitalizations among high-risk infants by about 50% [8].

Clinical Presentation

The clinical presentation of RSV infection will vary depending on the patient's age and health status. Most infections are self-limited and consist of typical upper respiratory infection (URI) symptoms such as rhinorrhea, nasal congestion, sneezing, cough, and occasionally fever. Among children less than age two or in patients with other risk factors for severe disease, RSV may progress to the lower respiratory tract, resulting in symptoms of bronchiolitis such as wheezing, accessory muscle use, tachypnea, or coarse crackles upon lung auscultation. Some patients may develop pneumonia and more severe symptoms such as hypoxia, apnea, or acute respiratory failure [9].

Diagnosis

The diagnosis of RSV is generally made clinically. Routine laboratory testing is not recommended except when positively identifying the presence of RSV is necessary to guide specific treatment or implement targeted infection control measures [7]. While a nasal wash will provide the highest sample yield, obtaining either a nasopharyngeal or mid-turbinate swab is generally sufficient [10]. Viral cultures provide the greatest accuracy but are not widely available and results can take from four days to two weeks. In most cases, PCR or rapid antigen testing is used.

PCR tests for RSV are highly sensitive and many hospitals can provide results in less than three hours. In lower-resourced facilities, or in outpatient settings, rapid antigen testing may be used. Although convenient, antigen testing is less accurate than viral culture or PCR methods and may result in false negatives. The likelihood of obtaining a falsely negative result from a rapid antigen test is greater in adult patients, as nasal viral shedding decreases with age [11].

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Home Management

Most patients with RSV will have symptoms consistent with that of the "common cold" and will not require the care of a healthcare provider or hospitalization. In general, patients should be advised to ensure adequate fluid intake and to take over-the-counter pain relievers, such as acetaminophen or ibuprofen, as directed. Infants under the age of six months should not be given ibuprofen due to the risk of renal injury, and aspirin should not be given to children under the age of 18 due to the risk of Reye's syndrome.

The use of a cool mist humidifier near where the child sleeps is recommended to help thin mucus and improve comfort. Warm mist humidifiers should never be used around children due to the risk of burn injuries. Those caring for younger children and infants should be taught how to properly use a bulb syringe and be encouraged to remove mucus by suctioning the child's nose if needed.

When to Seek Emergency Care

Patients should seek immediate medical attention if they have difficulty breathing; have increased work of breathing (i.e., accessory muscle use or nasal flaring); develop cyanosis; develop uncontrollable coughing; become lethargic, confused, or difficult to arouse; or experience periods of apnea. Caregivers should be told not to attempt to drive a child to the hospital themselves if they are having trouble breathing or are severely agitated or lethargic but to call 9-1-1.

Hospital Care

Hospital treatment for RSV bronchiolitis is primarily supportive. Supplemental oxygen support may be indicated for cases where hypoxia is present. Rarely, mechanical ventilation may be required. In the emergency department, care focuses on addressing respiratory complications and managing fluid replacement. While it is reasonable to provide a one-time dose of an inhaled bronchodilator, such as albuterol, for patients experiencing severe RSV bronchiolitis, the routine administration of these medications is not recommended. Despite their frequency of use, nebulized hypertonic saline and glucocorticoids are not recommended [12].

Inpatient care includes frequent reassessments of respiratory and hydration status. In addition to monitoring input and output, nurses and providers should be aware that symptoms such as fever and tachypnea can lead to increased insensible fluid losses. Ongoing respiratory distress may lead to a secondary decrease in oral fluid intake, compounding fluid management challenges—especially in young children and infants.

Supplemental oxygen should be administered to maintain oxygen saturation in accordance with institutional policy. The American Academy of Pediatrics recommends maintaining oxygen saturation at greater than 90% for children with bronchiolitis, however there is no universally accepted target [13]. If additional ventilatory support is required, heated humidified high-flow nasal cannula (HFNC) or continuous positive airway pressure (CPAP) may be used. Endotracheal intubation may be indicated for patients with persistent respiratory failure despite less invasive interventions, or in children experiencing apnea, significant retractions, or decreased responsiveness.

RSV is a common, seasonal respiratory virus that can cause mild to severe symptoms in children and adults. It is spread primarily

through direct contact with respiratory secretions and through large, aerosolized droplets. Infants less than six months of age, infants born prematurely, adults aged 65 or over, and anyone with underlying immunocompromise or pulmonary illness are at the highest risk for complications. Most cases can be managed at home with emphasis on maintaining adequate hydration and symptom relief. When symptoms worsen, patients should seek medical attention and may require emergency interventions and hospitalization for severe respiratory distress or hemodynamic instability.

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Immunity Debt: Something New is Old Again

By Tobi Ash, MBA, BSN, RN | *Staff Writer*

Immunity debt is a theory that sounds like it has always been around. However, it was very recently published in 2021 describing French children. The concept of immunity debt is that the body, and specifically the bodies of children, needs exposure to viruses to build up the immune system [1].

Cohen et al. noted that COVID-19 public health measures including masking, school closures, isolation, and stay-at-home mandates sharply under-stimulated the immune systems of children. This understimulation, lasting a year or more, increases the severity when the individual is finally exposed to a virus, and this concept is responsible for the rise and virulence of viruses we see currently, especially in pediatric wards [1].

The concept of immunity debt that postulates immune defenses do not work as well when the immune system is not active, making the body more vulnerable to both viral and bacterial infections. Frequent exposure provides "training" to the immune system, and reprogramming leads to a stronger response when the individual is exposed again [2]. Immunity debt proponents are concerned that increased hygiene in children has reduced exposure to viral infection and has led to decreased immune training in this population.

Cohen et al. noted several common pathogens and illnesses that affect children including respiratory syncytial virus (RSV), rotavirus, varicella, measles, bacterial, and other viral infections that dropped dramatically during the protective measures placed during the pandemic [1]. In the United States, seasonal influenza rates were almost non-existent during the first year of the pandemic, prompting the Centers for Disease Control and Prevention (CDC) to state, "Estimates are not available for the 2020-2021 flu season due to minimal influenza activity" [3]. As schools reopened, stringent health measures were minimized or eliminated, people resumed regular social activities, and viruses began circulating again, especially in children.

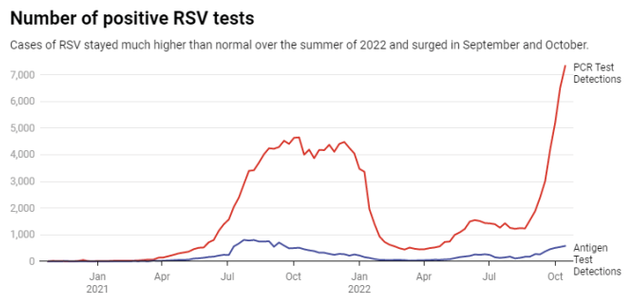

Chart: The Conversation CC-BY-ND. Source: Centers for Disease Control and Prevention [12]

The immunity debt theory has found a champion in the press; they are proposing that social distancing, virtual schooling, plastic barriers, and masking left the children without "trained" immunity. It is not just the press that are touting this theory. Immunity debt may also be a cash cow. Abbott Nutrition, makers of PediaSure, has a full page in their brochure about immunity debt stating that, "kids staying indoors for long prevents exposure to common bacteria causing immunity debt." Additionally, they advise that using two scoops of PediaSure can help bolster the pediatric immune system [4]!

Is our immune system like a muscle—if you don't use it, you lose it? Does constant exposure to viruses strengthen the immune system? Did we set up our children for viral and bacterial infection by understimulating their immune systems and by restricting their socialization?

A Quick and Dirty Review of the Immune System

The immune system is a large complex network that keeps the body healthy and is a defense system against germs, bacteria, viruses, and parasites. Organs of the immune system include the skin, mucous membranes, spleen, thymus, tonsils, and bone marrow. Macrophages, T and B lymphocytes, and granulocytes are some of the specialized cells that are part of the immune system. The lymphatic system carries immune cells that are found in lymph nodes throughout the body [5].

The immune system detects and neutralizes harmful substances from the environment. This happens when it encounters a new antigen or activates memory cells that remember old antigens. It also maintains a healthy equilibrium of cell death and cell regeneration. These actions are done by several mechanisms [5].

The innate immune system is the first line of defense to prevent infection and attack pathogens, and a response occurs fairly quickly, within minutes to hours. Innate immunity first uses the barrier response to prevent pathogens from entering the body. These include skin and mucous membranes in the nose, eyes, mouth, and intestinal tract. The second response is the non-specific immune response. The innate response only recognizes a few of the invaders and treats all invaders the same way. The cells involved in innate immunity do not remember the specific antigens, do not remember when they attacked previously, and do not give continued ongoing protection against infections [5].

A third response is an acquired or specific immune response. This type of immunity is not present at birth but is learned by the body, and the learning period begins when an antigen enters the body and the body recognizes it as a foreign invader. The body creates special cells that learn the best way to attack this antigen and develops a memory for that particular antigen. In fact, acquired immunity can also be called specific immunity because it attacks the specific antigen it has met before. Acquired immunity takes some time to develop after it is first exposed to a new antigen. These cells literally learn what the antigen is, adapt themselves to be able to attack it, and remember that exact antigen. Once these cells remember, future responses to that particular antigen are much faster and more effective as compared to an initial exposure [5].

The Wonder of Vaccines

Innate immunity is the type of immunity that may be understimulated by lack of exposure. Though it is not specific, it is not an unintelligent, automatic response to pathogens. Researchers and scientists who worked on the tuberculosis vaccine noted a decrease in overall deaths as well as protection against other respiratory infections. The Bacille Calmette-Guérin (BCG) vaccine was first introduced in the 1930s to target tuberculosis, and in the 1970s, the World Health Organization (WHO) launched a BCG immunization campaign in African and European countries. Multiple studies showed that although this vaccine was developed specifically to prevent tuberculosis, it

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had many nonspecific effects. Some of these effects "bestowed a type of immunological memory" on the innate immune system, and this innate training was shown to protect against viral infections [6].

Vaccines can have a protective effect, in addition to the specific immunity induced, by reprogramming and stimulating the innate immune system. Scientists and researchers were well aware of the training for the adaptive immune system, and they are now researching how the innate immune system also receives training. There is increasing evidence that our innate immunity can be enhanced by training the immune system. Certain live attenuated vaccines had already demonstrated this form of trained immunity, for example, smallpox, yellow fever, and live polio stimulated both the specific and innate immune response. Currently, this reprogramming is believed to be epigenetic. Scientists are researching how the epigenetic changes wrought by infection and vaccinations train the innate immune system to be more protective [7].

Should we look at these new studies into the innate immune system and conclude that the marked rise in viral illnesses in children is due to immunity debt? Partially this might be true.

Most children have been infected with RSV by the time they are two years old, as it is the most common cause of acute respiratory infection in infants and children [8]. Many young children who would have been exposed to RSV but had not due to isolation measures are being infected now. Without the protective pandemic measures, the virus would have staggered in this pediatric population, however now these children all are getting RSV at the same time. It is not just RSV that is landing children in the hospital; several different viruses including influenza, parainfluenza, and respiratory enteroviruses are affecting children as well.

What Should We Do?

Cohen et al. argue for vaccination and a "reinforced catch-up vaccination program" of French children to avoid a dispute over public health measures including masking and school closures [1]. The success of vaccines for many childhood killers including diphtheria, measles, hepatitis, polio, and others prevented these infectious viruses from encountering our immune systems, and the marked difference of life expectancy for children in the past two centuries stands testament to vaccine effectiveness. For every thousand babies born 200 years ago, 462.9 died before age five, and in 2020, only seven deaths were noted per 1000 births [9].

Scientists are currently researching trained immunity-based vaccines that would have a multi-pronged approach. The first is to increase protection by using both the innate and adaptive (B and T cell response) immune systems, and the second is to provide protection to unrelated pathogens using innate training. Future vaccines could help prevent infections for viruses that currently do not have vaccines, and this would help the most vulnerable patients such as newborns, the elderly, or those with an autoimmune disorder. Lastly, this type of vaccine would pre-condition the innate immune system and it would strengthen sub-optimal vaccines or be beneficial for those who do not respond efficiently to vaccines [10].

A Final Word

Many studies on COVID-19 and long COVID have found that close to one in five recovered individuals suffer from persistent symptoms for many months afterward, even those who experienced a mild infection. These reports seem similar to other post-infectious syndromes and point to long-lasting deregulation of the immune response in those who are recovering from COVID-19 [11]. There are some who suggest that children who are so ill from RSV now may have had asymptomatic COVID-19 infections previously which caused the deregulation of their immune systems. It is not necessarily immunity debt that is causing a rise in pediatric cases as it may be a deregulated immune system caused by a prior asymptomatic COVID-19 infection.

There is hope! Progress on an RSV vaccine is promising, and the better we can protect our children with targeted vaccines that help bolster both the innate and adaptive immune system, the healthier they will be.

TL:DR Immunity Debt

There are those that believe that public health measures for COVID-19 made children sicker. Lack of socialization, masking, virtual school, and staying at home understimulated children's immune systems. This created immunity debt and as the world opened up, children are much sicker now than had they been exposed throughout the pandemic.

Immunity Debt is a recent theory published in Infectious Disease Now in 2021 about French children. It is important to note that this paper has no evidence cited to back up the theory.

Conclusion: Normally, children are exposed to viruses in a staggered manner. With lockdowns and stringent public health policies in place, their exposure was restricted. They are now exposed all at once. Others say that these children may have had asymptomatic COVID-19 infections. There is some evidence that post-viral COVID-19 deregulates the immune system. This lack of protection has increased the virulence and rates of RSV, influenza, and other viruses in children.

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Antibiotic Use in Infants and its Effect on the Microbiome

By Shevi Rosner MSN RN-C | *Staff Writer*

Neonatal sepsis is an infection of bacterial, fungal, or viral origin that is associated with hemodynamic and/or other physical changes and causes significant morbidity and mortality. Early onset sepsis is acquired before or after delivery and is usually associated with a vertical transmission from mother to infant. The most common organisms associated with early onset sepsis are *group B streptococcus (GBS)* and *Escherichia coli* among others [1]. Risk factors for early onset sepsis include chorioamnionitis, prolonged rupture of membranes greater than 18 hours, delivery before 37 weeks gestation, maternal GBS colonization, meconium aspiration syndrome, and multiple gestation [2,3]. Late onset sepsis occurs three days or more post delivery, and the most common bacterial organisms are GBS, *E. coli,* and *Staphylococcus aureus.* Viral infections in late onset sepsis are usually caused by herpes or enterovirus, and candida is commonly the source of fungal infections in these cases [1]. Some incidents of late onset sepsis are due to delayed manifestation of vertically transmitted diseases but most are acquired from the hospital environment such as use of ventilation, contaminated surfaces, delayed feeding, surgical equipment, underlying respiratory and cardiac disease, and from community sources [1-3].

It is difficult to discern when an infant is septic as they do not speak and cannot tell the providers and nurses when they do not feel well. Signs of sepsis can be subtle to healthcare workers as well as parents [4]. Change in vital signs such as hypothermia, hyperthermia, bradycardia, and desaturation events can clue the health care team into a potential case of sepsis [1,5]. Typically, in these situations blood work such as complete blood count (CBC), C-reactive protein (CRP), and blood culture are drawn and antibiotics are started for 48 hours. Urine samples are also obtained in late onset sepsis, and if there is suspected meningitis, a sample of cerebrospinal fluid (CSF) is cultured via a lumbar puncture procedure [1]. Since a CBC and CRP may provide non-specific information regarding sepsis, the gold standard for diagnosis of sepsis remains the blood culture [5]. If the blood and urine cultures remain negative at the 48 hour mark, antibiotics will then be discontinued.

Treatment for sepsis is broad spectrum antibiotics administered intravenously and narrowed once a pathogen and antibiotic sensitivity is identified [4,6]. Antibiotics prescribed for presumed sepsis include beta-lactams (such as penicillins, cephalosporins, monobactams, and carbapenems), aminoglycosides (such as gentamicin), and glycopeptides (such as vancomycin) [3]. Most commonly, early onset sepsis is initially treated with ampicillin and gentamicin, while late onset sepsis is treated with vancomycin and gentamicin [4,6]. A combination of antibiotics is always used to treat presumed sepsis to enhance the effect of coverage, increase the chance of treating the presumed bacteria, and to suppress the development of organisms that are resistant to antibiotic treatment [3].

While the use of antibiotics is not benign, the risk of sepsis and its detrimental effects is severe as compared to the effects of antibiotic use. Infants with sepsis can suffer from impaired neurological and motor development, cerebral palsy, as well as ototoxicity and nephrotoxicity, so prompt treatment for suspected sepsis is critical. Mortality rates for sepsis are inversely related to the gestational age, so a septic premature infant is at higher risk of morbidity and mortality as compared to infants born at term. This is due to the immature immune system and decreased level of immunoglobulins in premature infants [2].

Antibiotics are the most commonly prescribed drugs in neonatal intensive care units [7], and in the past 20 years, there has been a push to decrease the use of antibiotics to minimize the negative effects for infants who truly do not need these medications [5]. Aside from the side effects of unnecessary antibiotics, there has been a rise in resistance to antibiotic therapy over the years, with a decrease in new antibiotics available on the market to treat resistant bacteria [3,8].

Immediate effects of increased use of antibiotics in the infant population include increase in length of stay, healthcare cost, severe candidiasis, as well as resistance to antibiotics [2,5]. Additionally, loss of blood volume is increased when blood specimens are drawn to accurately dose antibiotics for peak and trough levels [9]. Some of the long term effects include an altered gut microbiome, hearing loss, necrotizing enterocolitis, asthma, obesity, and irritable bowel disease [1,5,9,10].

The infant's microbiome is variable, yet relatively benign bacteria and infections may overwhelm their system causing sepsis [4]. In the same vein, unnecessary antibiotic treatment and the effects of stress related to sepsis may cause permanent changes to an infant's fragile and developing microbiome [10]. The gut microbiome comprises a few hundred bacterial species that colonize in the intestines, and it helps to build immunity and be a defense against infections. The microbiome also functions to digest and supply vitamins and nutrients [6,8]. Babies born vaginally are colonized faster with maternal flora than those born via cesarean section, and colonization is impacted for babies whose initiation of feeding is delayed, are fed formula versus breast milk, receive antibiotics, and have extended stay in the hospital environment [6].

When the intestinal flora is affected and weakened, it allows access for skin flora to enter the bloodstream and cause an infection [6]. Additionally, there is a strong connection between the nervous system and the intestines, as the gut microbiome affects the neural pathways and development of the newborn brain. Dysbiosis, which is defects and alterations to the intestinal microbiome, can impact neurocognitive and emotional development, social functioning,

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and memory [10]. Interestingly, preadolescent males who received antibiotics in infancy are at higher risk for being overweight, and this is due to changes in the microbiome [8]. Research is in progress on the use of probiotics to replenish and strengthen the gut microbiome that is affected by antibiotic use and other harmful factors, but at this time there is no consensus on its benefits and dosing specifically for infants.

While antibiotics are the most common pharmacological therapeutic administered in the NICU, close to 95% of the infants treated for sepsis do not have proven infections [3]. To minimize the short and long term side effects of unnecessary antibiotics, it is prudent to follow protocols of antibiotic stewardship programs which aim at decreasing overuse or misuse of antibiotics and the increasing resistance to antibiotic therapy. If bloodwork shows no concern for sepsis, and the infant is no longer appearing ill, then antibiotics should be discontinued in a timely fashion.

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Infectious Diseases and Healthcare Workers

By Sarah Bracha Cohen, MSN, RN, CNL | *Staff Writer*

Healthcare workers (HCW)—including physicians, nurses, emergency medical personnel, dental professionals, medical and nursing students, laboratory technicians, pharmacists, hospital volunteers, and administrative staff [1]—are at an increased risk of contact to and spread of infectious agents due to the nature of their jobs. Aside from their increased risk and exposure in the work setting, HCWs must be careful not to be exposed to infections in the community that can spread to coworkers or patients at work, potentially causing healthcare-associated infections as well as occupational injuries and infections [2,3]. Additionally, nurses are at an increased risk of causing healthcare-associated infections to their patients due to various causes by nature of their work, including significant staffing shortages and heavy nursing workloads [2].

Infectious agents—including bacteria, fungi, viruses, and parasites that can be found in blood, tissues, secretions, other bodily fluids, contaminated medical supplies, devices, equipment, environmental surfaces, or air—are organisms capable of producing infection, disease, or even death [3,4]. Common or significant infectious diseases HCWs are exposed to include bloodborne pathogens (such as HIV/AIDS, hepatitis B, and hepatitis C), seasonal and pandemic influenzas (flu), cytomegalovirus (CMV), ebola, Methicillin-resistant Staphylococcus aureus (MRSA), Vancomycin-resistant enterococcus (VRE), tuberculosis (TB), severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), Zika, and norovirus [4,5]. HCWs are most commonly exposed through percutaneous injuries such as needlesticks, mucous membrane or non-intact skin contact, or inhalation of aerosols [3,5]. MRSA and VRE are two common infectious agents spread through direct or indirect contact [5]. Droplets containing infectious agents are created when an infected individual coughs, sneezes, or talks, or during certain medical procedures, such as suctioning or intubation [5]. Examples of droplet transmitted infections are flu and pertussis (i.e., whooping cough) [5]. Only a few infectious agents are spread via airborne transmission, with TB and measles being the most common [5].

There are several ways healthcare workers can protect themselves and others against the spread of infectious diseases. Immunizations, personal protective equipment (PPE), proper ventilation (e.g., HVAC), hand hygiene, isolation precautions, disinfection and sterilization, proper working conditions, and staffing are key protective measures [1,2,5-7]. Recommended vaccines for HCWs include hepatitis B, flu, MMR (measles, mumps, and rubella), varicella (chickenpox), Tdap (tetanus, diphtheria, pertussis), meningococcal, and COVID-19 [1]. There are many states with laws dictating which immunizations are recommended or mandated [1]. The Occupational Safety and Health Administration (OSHA) and Centers for Disease Control and Prevention (CDC) provide guidelines of PPE use and infection prevention and control based on mode of transmission in order to protect both the HCW and environment from the spread of infectious diseases [5,6,8]. PPE can include any combination of the following: gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, coveralls, vests, and full body suits [8].

Appropriate management of potential infectious exposures and illnesses among HCWs can prevent the development and transmission of infections [3]. Effective management includes prompt assessment of exposures and diagnosis of illness, monitoring for disease signs and symptoms, and providing post-exposure or illness management [3]. Hospitals should have sick leave options that encourage non-punitive reporting of any potentially infectious exposures or illnesses, use of sick leave, and adherence to work restrictions [3]. HCWs need around-the-clock access to clinical providers with expertise in exposure and illness management including counseling, prompt laboratory testing, and medical treatment [3].

Having proper nursing conditions such as adequate staffing helps control the spread of infectious diseases by HCWs [2,3,6]. The Institute of Medicine's (IOM) report, To Err is Human, reported that tens of thousands of Americans die each year as a result of health care human error [2]. In a more recent IOM report, Keeping Patients Safe, Transforming the Work Environment of Nurses, it was reported that nursing is linked to patient safety

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and emphasized that poor working conditions and inadequate staffing for nurses increase the risk for errors [2]. Nurse working conditions are related to patients' risk of healthcare-associated infections and occupational injuries and infections among staff [2]. A recent report by the Agency for Healthcare Quality and Research found that there is a relationship between lower nurse staffing levels and higher incidence of adverse patient outcomes [2]. Nurses' working conditions have been associated with several errors and poor outcomes including the spread of infection and the spread of disease during outbreaks [2].

In a study by Hessels et al. (2019), nurses and infection preventionists reported workload increases of >60 minutes for patients with Clostridium difficile (C. diff), lice or scabies, flu, mumps or measles, and TB [6]. Among the staff, isolation precautions, patient and family education, staffing changes, chart review, exposure list compiling, and exposure preventive measures were the most frequently reported time-consuming activities due to infections [6]. Studies show an inverse relationship between infectious diseases and nurse ratios and workload—episodes of bloodstream infections (BSI), MRSA, pneumonia, post-operative infections, urinary tract infections (UTI), and gastrointestinal infections were decreased when ratios and workloads remained low, but were seen in increase when ratios increased or the workload got higher without proper staffing compensation [2].

Poor working conditions are also associated with increased HCW exposure [2]. A cross-sectional study of >1500 nurses in 20 hospitals found that poor organizational climates and high workloads were associated with increases of 50% to 200% risk of needlestick injuries and near-misses [2]. Annual work-related exposure to blood and body fluids (via needlestick, spray or splashes to the eyes or mouth, or direct contact with non-intact skin) ranges from <10% to 44%, depending on the occupational subgroup, with nurses being the most likely affected [2]. Each year, approximately 600,000-800,000 needlestick injuries occur in the United States [2]. HCWs are also at a greater risk of exposure to emerging infectious diseases and outbreaks of recognized contagious illnesses [2]. For example, much of the worldwide SARS outbreak occurred within hospitals, and HCWs made up a large proportion of cases, accounting for 37% to 63% of cases in highly affected countries [2]. Additionally, in many countries nurses were the largest single affected group [2]. In one survey, nearly 55% of nurses said they would not recommend the nursing profession to their friends or family due to poor working conditions and significant risk of infectious disease exposure [2].

Solely increasing nurse-to-patient ratios is not sufficient. Many studies have found that higher usage of pool or agency staff, in contrast to regular permanent unit staff, were associated with greater healthcare-associated infections [2]. Increased nurse skill mix (nurse ratio to total nursing personnel, including nurse aides) decreases the incidence of healthcare-associated infections [2]. A recent comprehensive literature review found that the evidence is growing showing the relationship between nurses' working environments and patient safety outcomes, including healthcare-associated infections, and that stability, skill mix, and experience in specific settings are important factors in this relationship [2].

HCWs, and especially nurses, are at an increased risk of not only exposure, but of spreading infectious diseases. Nurses and their work environments must take proper measures to protect themselves and their patients from exposure and spread. Creating safe work environments, including access to proper PPE and including better staffing, decreases the risk of healthcare associated infections for patients and risk of staff acquiring or spreading infections.

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How to Teach Prevention of STDs

By Ariela Kauffman, MSN, RN, PHN-BC, CMSRN | *Staff Writer*

One of the major risks of contracting a sexually transmitted infection (STI) (also referred to as sexually transmitted disease [STD]) is insufficient knowledge about sexuality, reproduction, and prevention. Lack of knowledge and access to contraceptives are closely linked to the development of human immunodeficiency virus (HIV), STDs, unwanted pregnancy and unsafe abortions in adolescents [1].

When it comes to properly teaching this topic, many have advocated for a comprehensive sexual education [CSE] curriculum to be used as a guide. However, even with a developed CSE, there are barriers to its proper implementation. In one study, teaching CSE was not a priority for teachers who took limited ownership of the new curriculum. Additional barriers were the incompatibility of CSE with local norms about sexuality and teacher-parent role dilemmas in implementing the policy. The use of discretion led to arbitrary teaching and therefore the CSE was not actually taught to the students in a generalizable manner [1]. CSE was not implemented properly and there was resistance from teachers who were asked to implement it. Inconsistent curriculum content was also a problem.

The difficulty in sexual health education is that it is tied to personal values and morals, perhaps sacred and private. Due to this, sexual health is often taught differently than other health education. CSE is not only about the physiologic act, but also includes social and interpersonal aspects of a sexual relationship. Sexual education does not lead to earlier and more frequent sexual activity, but rather the opposite. In the U.S., there is no federal mandate to teach sex education even after the emergence of STDs in the 1980s. It is still very common for programs to teach only abstinence. While legislation and federal/state support is helpful, changing social norms is the main factor to achieving CSE [2].

In a descriptive study in a rural area where poverty, unintended adolescent pregnancy and STDs were high, researchers found that the more comprehensive the sexual health education provided is, the more it reduces risky sexual behavior and increases protective behavior in adolescents. For the implementation of teaching to be effective, there needs to be committed stakeholders working at the school and in the community as well as strong policy [3]. One of the goals of Healthy People 2020 was to increase the number of adolescents who received formal education on reproductive health topics before age 18. Studies have found that comprehensive sex health education has preventative health behaviors for health outcomes for adolescents, and increased protective behaviors and reduced risky behaviors associated with adverse health outcomes. Since state requirements are broad, it is up to local agencies to support and provide resources for the delivery of sex health education, therefore the knowledge and skill of the school personnel are the most important factor [3].

What Needs to Change

The need to conduct a thorough sexual history and identify sexual health concerns or risky behaviors is lacking in primary care and psychiatric outpatient settings. This may be due to insufficient understanding or uneasiness of clinicians and patients in discussing personal and sensitive topics. Therefore, support and preparation are needed for clinicians to be able to elicit information regarding the sexual history of patients. Increased education to enhance sexual history taking is vital for medical education. Medical students felt they were not properly trained or educated on dealing with their patient's sexual concerns [4].

One suggestion is to provide continuing education activities and materials to nurses so they can properly address sexual concerns with their patients. Some possible factors contributing to the problem include incorrect assumptions toward sexual issues, lack of comfort and sexual knowledge, professional nursing roles, patient and nurse-related issues, work environment, continuing education activities, and social factors [5].

It is not only in Orthodox Judaism where educators and practitioners are hesitant to discuss sexual education and STIs. Religious communities such as Catholic, Evangelical, and Afro-Brazilian religious communities were included in a study to increase knowledge on sexual health and HIV prevention in their communities. It was found that HIV prevention is a challenge in religious communities [6]. Yet in spite of the hesitance, sexual education is relevant. In some religions where polygamy is practiced, women are more vulnerable to STDs. In closely regulated religious communities, there is often control of the content of health and sex education, often promoting only abstinence and fidelity [7].

Although being gay and Orthodox Jewish used to be considered an oxymoron, today there are homosexuals who self-identify as Orthodox Jews and continue to participate in religious communities. There are unique cultural factors, experiences, and challenges facing this population. There also can exist the transmission of HIV by married Orthodox Jewish men to others [10]. These scenarios demonstrate that risks of contracting STDs do exist in our Orthodox Jewish population. There are different subgroups within Judaism each with their own attitudes toward sexuality, modesty, and reproduction. These attitudes influence treatment and need to be understood. Healthcare practitioners, therapists, and health and sex educators need to understand these factors in order to tailor the interventions and be able to build trust and properly educate their patients regarding sexual health topics [11].

A study by Paiva et al. [6] showed that when HIV education is taught in a multicultural human rights framework and with a three-stage sexual health promotion lens, inter-religious tolerance is increased while providing an understanding of sexuality and the prevention needs of youth in different religious communities. This can serve as a basis for further educating youth on acquired immunodeficiency syndrome (AIDS) programs. Health educators should emphasize religious codes with positive values that are relevant to the HIV pandemic [7]. Most religious laws stand on the foundation of treating everyone with respect and without prejudice or discrimination. Religion should focus on making HIV an acceptable health condition and provide care for those people.

How to Teach Sex Ed and the Risks of STIs

There are many socio-cultural challenges to teach sexual health education to teens, some of which are denial of premarital sex,

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social concerns about the negative impact of sexual education, perceived stigma and embarrassment, taboo of sexual discussion, lack of advocacy and legal support, intergenerational gap, religious uncertainties, and imitating secular patterns of education. The resistance is more heavily influenced by cultural resistance than religious prohibitions. Overcoming cultural taboos is the main focus for the future[8].

Those educating on CSE need to have respectful communication, curious attitude, understanding, and not be pushy. They need to understand any cultural or social beliefs that underlie certain opinions of their clients. With the use of evidence based practice [EBP], educators and healthcare workers can correct myths and provide factual scientific information that can empower and also promote sexual health. They should also communicate clearly and make sure to listen and understand before responding or teaching. When nurses educate on other health topics, it opens an avenue to discuss sexual health education and other taboo subjects. Utilize culturally sensitive tools to create rapport and improve dialogue with the patient and create a safe and bias-free environment [2].

Patients need to know that decisions regarding sex also influence their health and well-being long term. It is society's job to provide them with CSE so they can make educated decisions and have the tools to maintain their health and prevent STDs and other health impacts. Sexual health education involves body awareness and development, sexuality, relationships, communication skills building, informed consent, and sexual health. Information on puberty, reproduction, abstinence, contraception, relationships, sexual violence and abuse prevention, body image, and sexual orientation, are taught by those who are trained in these areas and should be age appropriate. Education should be based on evidence and on what works best, but also maintaining the right to complete and honest information [13]. When done well, it can help mitigate the negative health consequences of teenage pregnancies which comprise 25% of new HIV infections and nearly 50% of the 19 million new STDs diagnosed in the U.S. each year. According to the Centers for Disease Control and Prevention (CDC), students who do not engage in health risk behaviors tend to have higher grades and academic success. CSE works at providing tools for kids to protect their health, delay sex, use contraception, and be monogamous [9].

Promoting abstinence only until marriage does not work because it assumes monogamous heterosexual marriage and is not supported by the majority of Americans. Withholding information on contraceptives puts those who are having sex at risk. Providing information on contraception does not increase the age of sexual initiation but instead helps people delay sexual initiation and protects them when they are active. Behaving responsibly requires receiving honest, comprehensive, reliable and age-appropriate science based information[9].

Effective transmission of education regarding STDs, prevention, and other sexual health topics in the Jewish community should begin with adolescents. There are many parts to an effective teaching program which include:

1. Inform parents that teenagers may be engaging in sexual activity even if parents are not aware of it.
2. Teach children basic anatomy, consent, reproductive health, and prevention methods.
3. Teach what STDs are and how they are transmitted.
4. Teach adults in monogamous marriages that they may also be susceptible to STDs. Those having affairs should be aware that failure to protect one's self when having sex outside the marriage can lead to transmission of an STD to one's spouse.
5. Know the signs and symptoms of STDs.
6. Ensure that education is provided in a culturally competent manner regarding orthodoxy and also to each level of understanding (teen vs. adults vs. sheltered vs. exposed).
7. The Orthodox Jewish community needs to be aware that homosexual relationships occur in teenagers and married men. These encounters can introduce STDs.

One of the reasons why sex education is often delayed in Orthodox Jewish communities, as well as other religious communities such as Islam and Catholicism, is that there is the assumption that there is no need to learn until the time of marriage when sexual activity is presumed to begin. This is problematic as it does not provide useful and necessary information such as transmission of STDs, the menstrual cycle, pregnancy, sexual abuse, reproduction, anatomy, and how to communicate in a healthy and safe way. Jewish values such as sexual restraint, modesty, intimacy, and holiness can be maintained while also teaching risks, responsibilities, prevention, and contraception. It is unrealistic to believe that all Orthodox Jewish teenagers will not have sex before marriage, therefore comprehensive sexual health education is crucial. The mitzvah of "*lifnei iver lo titein michshol,*" means we do not put a stumbling block before the blind thereby causing him to sin. By not providing sex education within Jewish education, we are putting our teenagers and young adults in danger and at risk of adverse health outcomes. To prevent promotion of sexual activity in teenagers before marriage, we must provide the tools for them to act responsibly and safely.

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Inappropriate Distribution of Antibiotics In Urgent Care Settings

By Dina Bressler, BSN, RN, WTA | *Staff Writer*

When looking at Emergency Health Facilities, Urgent Care settings have shorter waiting periods, quicker results and are often 1/10 of the cost of an Emergency Room visit [1]. With a focus on customer service and convenience, this 15 billion dollar industry has grown rapidly, growing 119% in recent years, while Emergency Room visits have decreased by 36% [2].

Every year nearly 80 million antibiotic prescriptions are incorrectly dispensed in the United States. In 2019 the Centers for Disease Control and Prevention (CDC) documented 2.8 million antibiotic resistant infections in the United States, with more than 35,000 deaths. Often, antibiotics may be inappropriately recommended, such as in cases of bronchitis, influenza or the common cold. This perpetuates the standing issue of antibiotic-resistant bacteria [3]. Nearly 2/5 of all urgent care visits result in the prescription of antibiotics. In fact, as of 2018, more than half of all visits in nearly 10,000 urgent care facilities were pertaining to upper respiratory tract infections. In 30% or more of these visits, clinicians provided a prescription of unnecessary antibiotics [4].

Educational initiatives have been introduced to decrease the usage of unwarranted antibiotics. Interactive videos and seminars with providers, as well as pamphlets and posters for patients to view in the office, help inform and educate individuals. Although many providers will prescribe antibiotics as a means to retain customer satisfaction, there has been little to no association found between a reduction in antibiotic prescription of a provider and patient's satisfaction. [4]. By increasing awareness of avoidable antibiotic prescriptions, providers can decrease inappropriate antibiotic dispensation and can diminish antibiotic seeking behavior in the future. With the fast growing popularity of Urgent Care Settings, further research is necessary to best utilize this modality of healthcare, while providing safe and high quality care to all patients [3].

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Isolation Precautions

By Simone Shafiro

For many individuals who do not work in healthcare, isolation precautions were unheard of until the COVID-19 pandemic, and their initial introduction into the world of infection control was limited to hand hygiene and covering their mouth when sneezing and coughing. In March 2020, the face mask was introduced to the general public. This, as well as news footage from COVID-19 intensive care units, allowed the general population to have a greater insight into some of the isolation precautions implemented in healthcare facilities.

What are Isolation Precautions?

Isolation precautions are recommended measures to prevent the transmission of pathogens in hospital settings [1]. Despite such provisions primarily used in the hospital setting, isolation precautions can be traced back to the Torah, primarily Leviticus 13:15, regarding leprosy. Isolation precautions are vital for safe nursing practice and effective patient care when contagious illnesses arise. Isolation precautions consist of the donning and doffing of various forms of personal protective equipment (PPE), and the use of different separations between an ill patient and the general public. When used properly, the ultimate goal of isolation precautions is to prevent and minimize the spread of microorganisms.

When Were Isolation Precautions Established?

In 2007, the Center for Disease Control and Prevention (CDC) established a concrete set of guidelines, Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, outlining the different types of precautions and situations for use. Until this point, different variations of guidelines were published by the CDC, starting most notably with Isolation Techniques for Use in Hospitals (1st ed.), published back in 1970 [2].

What Variations Are There in Isolation Precautions?

The predominant form of isolation precautions, applicable to all patients, is standard precautions. The other forms of isolation precautions fall under the category of transmission-based precautions and include contact, droplet, and airborne precautions [3].

Standard Precautions

Standard precautions are applied to all patients to help prevent spread of infection. Proper hand and respiratory hygiene, the use of protective equipment as appropriate, and proper disposal of sharp objects among others are some of the behaviors included in standard precautions [3].

Transmission-Based Precautions

Transmission-based precautions are used to prevent spread of more specific diseases and require additional personal protective equipment. These types of precautions can be broken down into three dominant categories: contact, droplet, and airborne precautions [3].

Contact Precautions

The mode of transmission of infectious diseases requiring contact precautions is through direct and indirect contact with the patient or items in their environment. Patients with contact precautions are typically isolated in a single-person room that could be entered while wearing gloves and a gown. The gown and gloves are donned before entering the room and doffed before leaving the

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room. Though the patient should be in their own room, the door to their room may be left open. Goggles may also be worn if there is a risk of contamination [3].

Patients that require contact precautions are those with large draining abscesses, multidrug-resistant organisms (e.g., methicillin-resistant Staphylococcus aureus [MRSA] and vancomycin-resistant enterococci [VRE]), infectious diarrhea, eye infections (e.g., conjunctivitis), and bronchiolitis. With the rise of respiratory syncytial virus (RSV) infections across the United States, it is crucial to implement contact precautions for RSV patients, as RSV is a form of bronchiolitis. Additionally, patients with cutaneous illnesses such as scabies, herpes simplex, herpes zoster, varicella, and cutaneous diphtheria must be placed under contact precautions. Lastly, patients with infection-induced diarrhea from Clostridium difficile, norovirus, rotavirus, and hepatitis A may require isolation precautions [4].

Droplet Precautions

Droplet precautions are used for patients with infectious diseases whose mode of transmission is via air droplets. In these cases, infection is transmitted via close contact with respiratory secretions and mucous membranes from sneezing, coughing, and talking. When working with patients under droplet precautions, it is important to isolate the patient in their own room, and all personnel entering the room should wear a surgical mask to ensure they do not inhale any air droplets. Unlike airborne precautions, the droplets are much larger and travel shorter distances [3].

The majority of airborne infectious diseases fall under the droplet precaution requirements and most commonly include influenza, pneumonia, streptococcus, and pertussis. If splashing or spraying is likely, eye protection is also recommended. This is most commonly necessary when conversing with a patient with an infectious cough [5].

Airborne Precautions

Airborne precautions are implemented in cases where there are smaller aerosolized droplets that can travel longer distances. Patients under airborne precautions must be placed in an isolated, negative-pressure room where the door is kept closed at all times. Gloves, gown, and eye protection are worn when entering the patient's room, and it is crucial to wear a fit-tested N95 or higher respirator mask. When exiting the patient's room, all PPE should be removed except for the respirator mask [3].

Measles (rubeola), tuberculosis, and varicella-zoster–including chickenpox, disseminated herpes zoster, and severe acute respiratory syndrome (SARS) all require airborne precautions. This encompasses all forms of SARS-CoV, including the COVID-19 virus [6].

Infection control has been shown to be a fundamental component of nursing practice, and nurses play a crucial role in preventing viral, bacterial, and fungal transmission simply by regular hand washing. Universal precautions minimize the risk of transmitting blood-borne and air-borne pathogens to medical staff and hospital residents and reduce the risk of localized epidemics. To ensure isolation precaution compliance amongst staff and visitors, it is important to have signage outside patient rooms with necessary supplies and PPE readily available. Occupational Safety and Health Administration (OSHA), World Health Organization (WHO), and CDC guidelines, as well as hospital policies, should be regularly reviewed by staff to ensure that they're aware of any new developments and changes.

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Fecal Matters

By Shlomo Ungar

Fecal microbiota transplantation (FMT) is a seemingly primitive form of medicine, yet is at the cutting edge of treatment for recurrent *Clostridioides difficile* (formerly known as *Clostridium difficile)* infections (CDI). The FDA recently gave its first approval for FMT on November 30, 2022. Our gut microbiome is a diverse community of microorganisms that exists in symbiosis with the human host and plays a role in vitamin synthesis, fermentation of dietary carbohydrates, metabolism of bile, and competitive exclusion of pathogens, as well as numerous other immune system functions. Antibiotic administration can destroy many of our healthy microbiota leading to dysbiosis, an unhealthy state of the gut microbial ecosystem. This puts patients at risk for developing *C. difficile* infections marked by diarrhea, fever, abdominal pain, pseudomembranous colitis, and even toxic megacolon. Ironically, the current treatment for CDI is administration of more antibiotics, but recurrent infection is all too common and other treatment options are necessary.

A landmark study published in 2013 demonstrated that infusion of donor feces into the colon of a patient with recurrent CDI led to a cure rate of 93.8% without relapse as compared to a cure rate of 30.8% for oral vancomycin which is the standard of care [1]. Many other trials have since replicated the immediate effectiveness of FMT spanning the 10-12 week period post-FMT but did not study its durability. Investigators from the Mayo Clinic conducted a retrospective study using 374 patients who responded to FMT for recurrent CDI and found that 78% of them had a lasting effect throughout the next year even with exposure to risk factors for a new CDI [2]. This indicates that FMT is effective and durable, however its mechanism of action is not fully understood.

The effectiveness of FMT seems to correlate with the restoration of a healthy microbiome. Analysis of the microbiome from a woman successfully treated for CDI shows that she had markedly different characteristics pre-FMT compared to post-FMT (see Figure 1). Her post-FMT microbiome at day 14 strongly resembled the donor's baseline microbiome. With time, the recipient's microbiome characteristics changed some more, but still retained a closer resemblance to the donor's healthy microbiome compared to her pre-FMT microbiome [3]. This change might reflect her reaching a new homeostasis or possibly even her own microbiome from before her CDI.

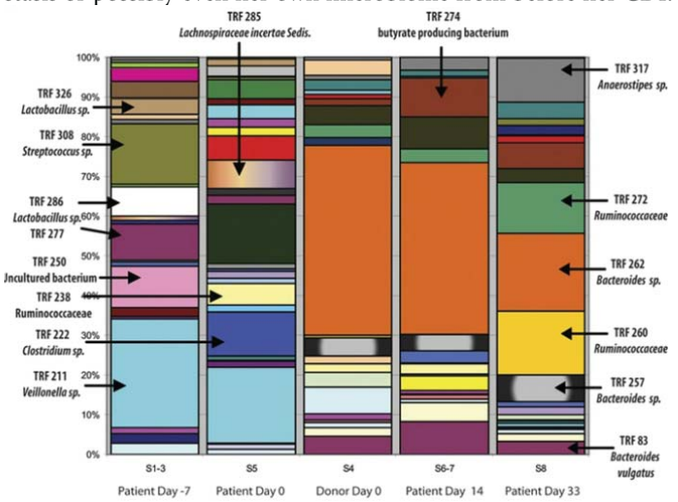

Figure 1: Comparison of the microbiome of an FMT patient to the donor's microbiome [3]

The correlation between FMT and microbiome alterations is convincing, however there can be multiple possible explanations as to why it is so important. One plausible explanation is that restoration of healthy bacteria in the gut can competitively exclude pathogenic bacteria due to limited nutrient availability, however a trial using sterile FMT (bacteria filtered out) demonstrated a complete cure in five out of five patients studied [4]. This proves that the effect of FMT is not mediated by live bacterial organisms, rather by some other protein product or bacteriophage.

A different convincing hypothesis about the mechanism involves the restoration of secondary bile acids in the colon. Normally, primary bile acids synthesized in the liver are converted to secondary bile acids by colonic bacteria, mediated by bile salt hydrolases (BSH). Cultures of *C. difficile* grown in media containing mostly secondary bile acids demonstrated the ability to prevent germination as well as vegetative growth, compared to cultures in media containing mostly primary bile acid [5]. Patients with CDI seem to lack BSH-producing bacteria, and thus their colons are dominated by primary rather than secondary bile acids. Restoration of a healthy microbiome via FMT allows conversion of primary bile acids to secondary bile acids and therefore serves to protect the patient from *C. difficile* growth. To prove this mechanism, investigators cultured *C. difficile* in a medium containing primary bile acids as well as wild-type *Escherichia coli* (which does not produce BSH) and the *C. difficile* colonies grew similarly to the control medium which contained just primary bile acids. They then genetically altered a strain of *E. coli* to confer a BSH producing gene and cultured *C. difficile* in a medium containing primary bile acids and modified *E. coli*. This time, the *C. difficile* growth was severely inhibited. This trial demonstrated that the BSH activity alone is responsible for protection from *C. difficile* growth [6]. This understanding can pave the way for novel synthetic therapeutic approaches that do not involve transplantation of human feces.

Currently, FMT is recommended for patients with recurrent CDI, defined as an initial infection with two recurrences. It is also used earlier in patients with severe or fulminant CDI, though further study is needed to determine when exactly FMT is indicated. There are also multiple routes of administration including injec-

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tion via colonoscopy, nasojejunal or nasoduodenal tube, enema, and even capsules. There have been few trials comparing effectiveness of different modalities and possibly lower administration is more effective than upper. Ultimately, choice of delivery route is based on clinical circumstances, availability, and patient preference [7].

Aside from CDI, there are many other diseases that are associated with a disruption of the microbiome, though causation has not yet been determined for any of those. As of now, the use of FMT is limited to treatment of CDI, but there are numerous studies being conducted to determine its role, if any, in treatment of other conditions including ulcerative colitis, hepatitis, metabolic syndrome, and even multiple sclerosis. In the meantime, hang tight to your microbiome, and do not let anyone tell you that bacteria are bad.

Shlomo Ungar studied in Yeshiva and Kollel for years before deciding to pursue a career in medicine. He is currently a father of three and a second year medical student at New York Medical College.

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Influenza and the Use of Antiviral Agents

By Rebecca "Rikki" Feldman, FNP-BC

Influenza (flu) viruses belong to the family Orthomyxoviridiae, which is characterized by a single-stranded and segmented RNA genome. Influenza viruses are classified into types A, B, and C based on their core proteins. The subtypes of influenza A viruses are determined by envelope glycoproteins possessing either haemagglutinin (HA) or neuraminidase (NA) activity. Flu strains are named based on differences in these glycoproteins (i.e. H1N1) [1].

Influenza A viruses infect a range of mammals (e.g. pigs and horses) and avian species, whereas types B and C infections are largely restricted to humans. Only types A and B cause human disease of any concern. Humans are generally infected by viruses of the subtypes H1, H2, or H3, and N1 or N2. Both influenza A and B viruses are common respiratory pathogens, although influenza A viruses are the main cause of large epidemics with high mortality [1].

New influenza A subtypes have been recorded since the middle of the 18th century and have been known to cause major global outbreaks at unpredictable intervals. The "Spanish flu" in 1918 was the most severe of these pandemics, causing an estimated 20-40 million or more deaths worldwide. Less severe pandemics occurred in 1957 and 1968 [1].

Flu Season

Although flu viruses circulate all year, in the United States flu typically circulates at the highest levels in the fall and winter. Peak activity is generally from December to February, although significant activity can begin to rise as early as October and last as late as May. Interestingly, these patterns have become less predictable since the start of the COVID pandemic. As an example, the Centers for Disease Control and Prevention (CDC) has been rating the severity of yearly flu seasons since 2003, but was unable to rate the flu season of 2020-2021 due to the extremely low level of flu activity [2].

Flu Burden

The effects of influenza vary year to year and are affected by several factors. The CDC estimates the yearly burden of flu based on several factors, including the characteristics of circulating viruses, the timing of the season, how well the vaccine is working to protect against illness, and how many people got vaccinated. The CDC estimates that flu has resulted in 9 million-41 million illnesses, 140,000–710,000 hospitalizations, and 12,000–52,000 deaths annually between 2010 and 2020 [3].

Transmission

Influenza can be spread between humans through direct contact, large respiratory droplets, and small particle droplet nuclei (aerosols). Primary transmission occurs by direct person-to-person respiratory transmission. This occurs at close-range (approximately six feet) via large droplets and aerosols. When an infected person coughs, sneezes, or talks, the virus particles within respiratory secretions can infect another person via inhalation or direct contact with the mucous membranes. Flu can also be spread by direct contact with contaminated surfaces or secretions [4].

Influenza incubation period is typically one to four days (with an average of two days). Flu viruses can usually be detected in an infected individual one day before the onset of symptoms and up to five to seven days after symptoms develop. Peak shedding occurs on days one to four of illness. However, infants and immunocompromised people may be contagious for longer than seven days [5].

Special Populations

Although the flu is generally a self-limited illness, certain groups are at higher risks for severe illness which can result in hospitalization and even death. Those at higher risk of complications include young children (<5 years and especially <6 months), pregnant women and postpartum women up to two weeks after delivery, older adults (>65 years), patients with chronic medical problems including asthma, chronic lung disease, diabetes, kidney disease, and obesity, and those who are immunocompromised. Long term care resi-

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dents and certain racial and ethnic minority groups are also at higher risk than the general population. From 2009 to 2019, Black people had the highest influenza hospitalization rates, followed by American Indian or Alaska Native people, then Hispanic or Latino people, and then non-Hispanic White people [6].

Signs and Symptoms

The spectrum of clinical manifestations and the severity of infection can vary with different types of influenza. Characteristic signs of flu include abrupt onset of fever, nonproductive cough, and myalgias. In some cases, the onset is so abrupt that patients can recall the precise time at which symptoms began. Other common symptoms include malaise, sore throat, nausea, nasal congestion, and headache. Gastrointestinal symptoms such as vomiting and diarrhea are usually not part of influenza in adults but can occur in 10 to 20% of children [7].

Older adults (≥65 years) and immunosuppressed patients are more likely to have subtle signs and symptoms; they may present without fever and with milder systemic symptoms as compared to other patients. Older adults also have a higher frequency of altered mental status and generalized symptoms such as anorexia, malaise, weakness, and dizziness, rather than typical findings such as sore throat, myalgias, and fever [7].

Complications

Serious complications of influenza are most often pulmonary and include primary viral pneumonia, secondary bacterial pneumonia, pneumonia attributable to unusual pathogens, and exacerbations of chronic underlying pulmonary diseases such as COPD and asthma.

Although direct cardiac complications are uncommon, both pericarditis and myocarditis have been noted. The indirect effects of influenza on underlying cardiac problems such as congestive heart failure and ischemic heart disease appear to play a more important role in cardiac morbidity. Strong observational data support the link between influenza infection and acute myocardial infarction and death.

Myositis and rhabdomyolysis have rarely been reported with seasonal influenza A and B.

Neurologic complications of seasonal influenza include encephalopathy (Reye's syndrome), encephalomyelitis, transverse myelitis, aseptic meningitis, focal neurologic disorders, and Guillain–Barré syndrome. These occur mostly in children [8].

Treatment

Available treatments for influenza include a variety of antiviral agents. There are four U.S. Food and Drug Administration (FDA) approved medications that have antiviral activity against influenza. Most well-known and preferred is oseltamivir (Tamiflu), a neuraminidase inhibitor. Neuraminidase inhibitors also include zanamivir (Relenza), an inhaled powder, and peramivir (Rapivab), given as a single intravenous dose. They are active against influenza A and B. Neuraminidase inhibitors interfere with release of progeny influenza virus from infected cells, thereby preventing new rounds of infection. Another less common agent is baloxavir (Xofluza), an endonuclease inhibitor [9].

Oseltamivir gained popularity during the 2009 H1N1 pandemic and was even given emergency use authorization at the time for treatment of children under 12 months of age for whom only limited data on safety and efficacy were available [10].

Since that time, the yearly surge of influenza during flu season brings with it many patient requests for Tamiflu—often thought of by patients as a panacea for resolution of their symptoms which can get them feeling better and back to work and school quickly while pharmacy stock runs low due to high demand. Direct to consumer marketing may contribute to the over-hyped effects of Tamiflu, which has been shown by many studies to have marginal benefit (reduction in symptoms of 12-24 hours) and comes along with many potential side effects [11].

Many additional studies have since been done to better research the safety and efficacy of oseltamivir.

Jefferson et al. [12] found potential bias in the clinical study reports of oseltamivir and in response conducted a systematic review of those reports. They studied 83 trial reports obtained from the European Medicines Agency and Roche and found that in the treatment of adults, oseltamivir reduced the time to first alleviation of symptoms by 16.7 hours, but there was an increased rate of nausea, vomiting, headaches, renal, and psychiatric syndromes. In treatment of children, oseltamivir induced vomiting. In prophylaxis studies, it reduced the risk of symptomatic influenza, but increased the

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risk of psychiatric adverse events and headaches, renal events, and nausea.

In an analysis performed by Wang et al. [13], the authors concluded that the use of antiviral agents for treating influenza infection in healthy children with no underlying medical conditions only showed a modest benefit in reducing the duration of illness, did not reduce mortality and readmission rate, and was associated with a reduced incidence of otitis media, but also a significantly increased risk of vomiting.

A multicentric, retrospective study performed in 10 hospitals of Madrid by Bueno et al. [10] showed that otherwise healthy children hospitalized with confirmed influenza infection did not improve their outcome in terms of duration of fever, duration of hypoxia, length of stay, admission to the pediatric intensive care unit, or bacterial complications when treated with oseltamivir in the first 48 hours after admission. Children with known risk factors for severe disease were excluded from the study. The authors concluded that hospitalization alone is not a good enough indication to treat otherwise healthy children with oseltamivir.

A systematic review and meta-analysis of observational studies by Hsu et al. [11] concluded that in high-risk patients, therapy with oral oseltamivir may provide a net benefit over no treatment. Factors studied included mortality, hospitalization, and duration of symptoms. Inhaled zanamivir may lead to shorter symptom duration and fewer hospitalizations, but more complications than no treatment. However, the confidence in the estimates of the effects for decision making was rated low to very low.

In 2006, the FDA added a warning to the label of oseltamivir drawing attention to the risk of developing neuropsychiatric adverse events. The incidence of these events was very high in Japan where oseltamivir is widely prescribed. There had been about 100 cases of abnormal behaviors and 70 deaths among children and adolescents in Japan alone [14]. In March 2007, Japanese authorities advised against prescribing oseltamivir to adolescents aged 10-19 years [15]. This unusually severe measure resulted from the separate suicides of two 14 year olds who jumped to their deaths while taking oseltamivir. Fifty two other deaths (14 in children or adolescents) have also been associated with oseltamivir.

The FDA review of clinical trial and post-marketing data concluded that these events were not clearly drug related but might be related to higher rates of flu related encephalitis in Japan. Since then, the FDA has required that doctors be warned that patients should be closely monitored for signs of abnormal behavior throughout the treatment period, and the European Medicine Evaluation Agency (EMEA) took similar steps [16].

Other case studies have shown an increase in neuropsychiatric adverse events in patients already diagnosed with mental illness. They have concluded that prescribers use caution and close monitoring when prescribing oseltamivir to patients with mental health diagnoses [14].

Recommendations

- The CDC recommends oseltamivir as first-line treatment for influenza with specific guidelines as to eligibility and timeframe for initiation of therapy [17]
- In order for antiviral therapy to be most effective against Influenza, treatment should be initiated as soon as possible, ideally less than 48 hours from symptom onset
- In patients with severe, complicated, or progressive illness, hospitalized patients, or those at increased risk for complications, treatment should be initiated as soon as possible even if more than 48 hours have elapsed since illness onset and should not be delayed by waiting for laboratory confirmation
- For symptomatic outpatients with mild illness who are not at increased risk for complications, treatment can be considered only if it can be initiated ≤48 hours following illness onset

Similarly, clinical practice guidelines from the Infections Disease Society of America (IDSA) (2018) recommend that antiviral therapy be started as soon as possible for adults and children with documented or suspected influenza, regardless of influenza vaccination history, who meet the following criteria [18]:

- Persons of any age who are hospitalized with influenza, regardless of illness duration prior to hospitalization

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- Outpatients of any age with severe or progressive illness, regardless of illness duration
- Outpatients who are at high risk of complications from influenza, including those with chronic medical conditions and immunocompromised patients
- Children younger than 2 years and adults ≥65 years
- Pregnant women and those within 2 weeks postpartum

Clinicians can consider antiviral treatment for adults and children who are not at high risk of influenza complications, with documented or suspected influenza, irrespective of influenza vaccination history, who are either [18]:

- Outpatients with illness onset ≤2 days before presentation
- Symptomatic outpatients who are household contacts of persons who are at high risk of developing complications from influenza, particularly those who are severely immunocompromised
- Symptomatic healthcare providers who care for patients who are at high risk of developing complications from influenza, particularly those who are severely immunocompromised
- Based on the above guidelines from the CDC and IDSA, oseltamivir is not generally recommended for healthy patients between ages 2 and 65 or who are not at high risk for flu complications, but can be considered if therapy can be initiated <48 hours from symptom onset [17,18]

Prevention

Vaccination is associated with a reduced incidence of influenza, hospitalization, ICU admission, and mortality. Flu vaccines are developed yearly, based on global surveillance of influenza viruses circulating at the end of the previous season. However, there may be mismatches between vaccine strains and the circulating strains, leading to a wide range of efficacy from season to season [19]. Other measures of effectiveness are influenced by several factors including age, baseline health, and immune function [20].

Potential adverse reactions to the flu vaccine include allergic reaction, especially in people allergic to eggs, local injection site reaction, and bursitis. Guillain Barre Syndrome has been associated with flu vaccination, however the actual degree of risk is unclear as multiple studies have been done with inconsistent results, and have found either a small risk or no causal relationship [19].

In the United States, a quadrivalent influenza vaccine containing two influenza A antigens and two influenza B antigens is available for the 2022-2023 northern hemisphere flu season.

Although imperfect, vaccination remains the best available prevention measure against the flu.

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Ventilator-Associated Pneumonia

By Yedidya K. Dear, BSN, RN, CSRN

Ventilator-associated pneumonia (VAP) is a hospital associated infection caused by one or more microorganisms while a patient is mechanically ventilated. Regardless of the route or reasoning behind mechanical ventilation, VAP is always a potential risk. Prophylactic measures to ensure pulmonary hygiene and thorough pulmonary assessment and monitoring should be implemented on every patient, every shift without fail.

VAP results from microorganism invasion of the lung parenchyma all throughout the respiratory tract. Nasotracheal and orotracheal intubation results in integrity loss of the oropharynx, trachea, and other structures permitting oral and gastric secretions to colonize in the airway introducing all sorts of bacteria to the airway. Being that the lower lobes of the lungs are moist, warm, and dark, this creates an especially thriving environment for bacteria to thrive and reproduce [1].

The most common microorganisms responsible for the development of VAP are *Pseudomonas aeruginosa, Escherichia coli, Klebsiella pneumoniae, Acinetobacter* species, and *Staphylococcus aureus* [2].

Ventilator use increases the risk of VAP daily, and the longer a patient is mechanically ventilated the higher the incidence. Elderly patients, immunocompromised patients, and patients with comorbidities such as chronic obstructive pulmonary disease (COPD), asthma, burns, diabetes, chronic kidney disease, and Hashimoto's thyroiditis are all at higher risk [3].

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VAP

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VAP is the most common hospital associated infection in the critical care setting, and the mortality rate of VAP is around 10%, with an increased mortality in the surgical critical care patient. It is still unknown how much VAP contributes to death in the critical care patient, but we know for certain that VAP prolongs the need for mechanical ventilation and lengthens a patient's ICU stay. VAP has been reported to affect 5-40% of patients receiving mechanical ventilation for periods of longer than two days [2].

VAP prevention measures include the use of silver coated endotracheal tubes, ultrathin polyurethane cuffs, and stress ulcer prophylaxis such as proton pump inhibitors (e.g., pantoprazole) and histamine 2 receptor blockers (e.g., famotidine). The patient's head of bed should be elevated 30-45 degrees, gastric residual volume should be assessed regularly, and enteral nutrition should be initiated. Closed in-line suctioning, oral suctioning every two hours, and an oral rinse with chlorhexidine every 12 hours is recommended. All members of the healthcare team should follow strict hand hygiene and assess extubation readiness daily using the Spontaneous-Awakening Trials and Spontaneous-Breathing Trials. Equipment and supplies (suction tubing, suction canisters, and yankauer catheters) should remain clean and exchanged regularly, and early patient mobility such as in-bed passive range of motion exercises should be utilized by physical therapists, occupational therapists and nursing staff. When warranted, a tracheotomy should be performed. Lastly, deep vein thrombosis prophylaxis should be implemented [4].

Diagnostic studies of VAP include radiographic studies (e.g., X-ray), clinical findings (e.g., increased secretions and pyrexia), bronchoscopy with bronchoalveolar lavage, and laboratory studies (e.g., inflammatory mediators and complete blood count (CBC) with new onset leukocytosis) [5,6]

Treatment is based on blood culture results, and antibiotics should be tailored to the specific pathogen to prevent resistance, with narrow spectrum antibiotics being preferred over broad spectrum antibiotics. [7]

By the age of 19, Yedidya K. Dear, BSN, RN, CSRN, graduated in 2021 as the youngest graduate nurse to acquire his Bachelor of Science in Nursing (BSN) at Chamberlain University College of Nursing. He has been working as an ICU and home health nurse in Texas since graduating. He is currently pursuing and furthering his education in order to achieve his future goals of becoming a Doctor in Nursing Practice with a focus in Adult-Gerontology Acute Care (AGACNP) and Family Practice (FNP).

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HALACHA COLUMN

Metzizah b'Peh

By Rabbi Elyakim Milikowsky

Over the last two decades there have been public controversies and debates about the permissibility of performing a specific element of a traditional *milah* (circumcision) due to the potential transmission of herpes simplex virus (HSV). HSV is prevalent among the adult population and is not considered dangerous. However, if an infant is infected with HSV it can be life threatening [1]. Traditionally, after performing a *milah*, a *mohel* (the one performing the *milah*) would perform *metzitzah b'peh*, orally suctioning the site of the *milah* to draw out the blood [2]. This contact between the mouth of the *mohel* and the freshly cut skin of the child can be a prime conduit of an infectious disease and on several occasions in different locales there have been campaigns to forbid or restrict *metzitzah b'peh* based on a claimed danger to the life of children undergoing the procedure [3]. The halachic responses to this campaign ranged across the entire spectrum of possible answers, from forbidding *metzitzah b'peh* in all circumstances, to saying that it would depend upon the specific *mohel* performing the *metzitzah*, to insisting upon its performance in all circumstances [4]. It is not our purpose to enter these controversies; rather we will provide the background necessary to understand how such diametrically opposed halachic responses can legitimately be arrived at in this and similar questions.

The first stipulation we will make is that in an isolated instance where *metitza b'pe*h presents a clear potential danger to the life of a specific child, we would forbid the performance of *metzitzah b'peh*. This is based on one of the primary rules in halachic decision making, *pikuach nefesh*, the saving of a life, which allows for doing that which would otherwise be halachically forbidden and disallows over the fulfillment of what would otherwise be a halachic obligation [5]. In the halachos of *bris milah* we find examples of both aspects of this principle. In cases of a clear possibility of danger to a child's life, that which is generally a *mitzvah* (commandment) becomes forbidden and the otherwise forbidden becomes required. An example of *pikuach nefesh* forbidding the performance of a *mitzvah* can be found in the halacha that after several (the exact number is disputed, either two or three) sons in a family die after having a *bris milah* performed on them a *chazaka* (halachic presumption) has been established that *milah* is dangerous for that family and further sons in that family may not have a *milah* performed on them [6]. An example of *pikuach nefesh* allowing that which would otherwise be forbidden can be found in the halacha that although one must take care before Shabbos to ensure that water is heated for a child undergoing a *bris milah* on Shabbos, if the previously heated water spilled, one must boil water on Shabbos to prevent a danger to the child [7]. Similarly, in a vacuum, in a case of clear danger to the life of an infant (or a *mohel*) the principle of *pikuach nefesh*

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would forbid *metzitzah b'peh* just as it would forbid *milah* itself.

The debate regarding *metzitzah b'peh* is whether various halachic considerations would cause us to disallow its performance when presented with a lower level of potential danger, even though it does not meet the halachic threshold of *pikuach nefesh*. Conversely, other halachic considerations could potentially compel us to require the performance of *metzitzah b'peh* even in the face of *pikuach nefesh*. To understand this debate we must analyze the halachic nature of *metzizah b'peh* and the history, and historical context, of the question of performing *metzitzah b'peh* in the face of potentially infectious diseases.

The Mishna (*Shabbos* 19:2) says that all aspects needed for a *milah* may be done on Shabbos and it lists four steps: the *milah* the circumcision itself; the *priah*, the rolling back of the membranes; the *metzitzah*, the sucking to remove the blood; and the placing of a cumin salve on the wound and bandaging it. The first two elements on this list are indisputably essential components of the mitzvah of *milah* and could only be forgone in cases of where the level of potential danger meets the threshold of *pikuach nefesh*. The last part of the Mishna, namely the application of the cumin salve and bandaging, is solely a medical remedy and as such there is no question that we may substitute alternative modern remedies if they are deemed to be medically preferred. The status of the third element on this list, the *metzitza,* is a matter of dispute. Is the suctioning of the blood after the circumcision an intrinsic part of the *milah* like the rolling back of the membranes, or was it instituted solely to prevent danger to the child by drawing out blood that would otherwise present a danger to the child, similar to the application of a cumin salve mentioned in the Mishna?

A simple reading of the Gemara (*Shabbos* 133b) that discusses this Mishna leads to the conclusion that *metzitzah* is solely a medical matter and not a *mitzvah*. Rav Pappa says in that Gemara that any *mohel* who does not perform *metzitzah* endangers the child and must be removed from his position. The Gemara then questions the need for his statement and says that we see that skipping *metzitzah* is dangerous from the halacha taught in our Mishnah: if we allow *metzitzah* on Shabbos it must be needed to prevent danger as we would only allow descrating Shabbos for a clear danger. If *metzitzah* were an integral part of the *mitzvah* then it would be permitted on Shabbos irrespective of any danger, just as *milah* itself is permitted on Shabbos.

The first recorded instance in halachic literature of the confluence of infectious disease and *metzitzah b'peh* was in 1836 when a doctor in Vienna suggested that *metzitzah b'peh* was responsible for dangerous sores that were afflicting children who had received a *bris*. The doctor asked the Chief Rabbi of Vienna, Rabbi Eliezer Horowitz, if it would be permitted to perform *metzitzah* through an alternative method, namely using a sponge to draw out the blood. Rav Horowitz was loath to answer such a weighty question on his own and forwarded the question on to his teacher, Rav Moshe Sofer. Rav Sofer, known as the Chasam Sofer, was the undisputed leader of Austro-Hungarian Jewry and he responded that it was permitted to suction the blood with a sponge, based on the above-mentioned understanding of *metzitzah* as primarily a medical necessity. The Chasam Sofer adds another reason to permit an alternative method of drawing out the blood, even if we would consider the *metzitzah* to be an integral component of the *milah*. The Mishnah only mentions *metzizah*, suctioning, and does not specify that the *metzitzah* must be done by the mouth. The only source in halachic tradition for *metzitza* to be done by mouth is practical—there was no other way to accomplish the suction other than by using the mouth. While it is true that there are Kabbalistic sources that require the *metzizah* to be performed solely by mouth, he says that we do not take these into halachic consideration in the face of potential danger, even if it does not meet the threshold of *pikuach nefesh*.[8]

An additional consideration to be lenient in performing traditional *metzitzah b'peh* when there is even a slight potential for the transmission of disease is the innovation of a method to perform *metzitzah* using the mouth of the *mohel* without requiring direct contact between his mouth and the freshly cut skin of the child. Developed by Rabbi Michael Fulda, the chief Rabbi of Fulda, Germany, this method utilizes a specially fashioned glass tube as an intermediary between the mouth of the *mohel* and the site of the *milah* [9]. This provides two distinct benefits over the sponge allowed by the Chasam Sofer: firstly it allows for true suction and not just wicking away the blood so it provides similar potential medical benefit as traditional *metzitzah b'peh*, and secondly it can arguably be considered *metzitzah b'peh;* even though the mouth does not contact the skin, it is still the source of the suction that occurs.

Based on the above considerations, many halachic authorities rule that in the presence of even a slight trace of danger, traditional direct *metzitzah b'peh* should not be employed. Many of these authorities mandate that indirect *metzitzah b'peh* should be substituted, while others allow for the use of a sponge or gauze pad instead. According to these opinions, traditional *metzitzah b'peh* can be eschewed even when the paramount halachic consideration of *pikuach nefesh* is not relevant.

There are, however, halachic authorities that hold that *metzitzah* is an integral part of the *milah* itself and also hold that the halachic requirement of *metzitzah* can only be fulfilled by direct *metzitzah b'peh*, whether for strictly halachic or Kabbalistic/halachic reasons. These opinions require that traditional *metzitzah b'peh* must be performed in all circumstances unless considerations of *pikuach nefesh* are present, in which case we would generally apply the principle that

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pikuach nefesh overrides standard halachic requirements [10].

Until now we have dealt solely with the *milah*-specific halachic considerations. There is another halachic aspect present in the *metzitzah b'peh* controversies that could potentially require the performance of *metzitzah b'peh* even in the presence of possible *pikuach nefesh*. The Gemara (*Sanhedrin* 74) teaches that even though the general rule is that when one is faced with a choice to forfeit one's life or commit a transgression he must transgress rather than die, there is an exception. In a time of *gezeiras hamelech* (literally, decrees of the king), when there are decrees of the government aimed at suppressing Jewish practice, one must forfeit their life for any mitzvah, and even for a Jewish custom such as the manner of tying one's sandal straps [11].

For the last two hundred years, campaigns against performing traditional *metzitzah b'peh* have been mounted in many countries for the prevention of a host of infectious diseases, from syphilis and tuberculosis to acquired immunodeficiency syndrome (AIDS) and HSV. Undoubtedly many of these campaigns were solely motivated by health considerations, and the halachic decision would be rendered based solely on the relevant laws of *milah* and *pikuach nefesh*. However, it is certainly possible that some of these campaigns were at least partially motivated by a desire to discourage the traditional observance of the *mitzvah* of *milah*, whether by proponents of the Reform movement in 19th century Austria-Hungary or Germany or 21st century progressive secular humanists in Israel or New York. If a situation were ever to arise wherein it would be generally understood that a specific campaign to outlaw or discourage traditional *metzitzah b'peh* for ostensibly health related reasons was really an attack on the performance of the *mitzvah* of *milah*, then there would be a strong halachic argument to require the performance of traditional *metzitzah b'peh*. This would be true even according to those authorities that generally rule that direct *metzitzah b'peh* is not required for *milah* and allow for a tube or even gauze to be utilized instead, because in a time of *gezeiras hamelech* we are required to forfeit our life even for matters of tradition alone.

As stated in the beginning of this article, the intent of this article is not to take a position in the recent controversies regarding *metzitzah b'peh* and HSV. Rather, through our analysis of the underlying halachic principles relevant to this topic we have isolated three questions that must be addressed whenever a similar question presents itself, whether it be the possible transmission of a different disease through *metzitzah b'peh* or the potential of another *mitzvah* or *minhag* (custom) spreading infectious disease through any other process, for instance making a *minyan* during a pandemic:

The halachic status of the act in question: Is it mandated or recommended? Is it a *mitzvah* or a *minhag*? Is it based on halachic or Kabbalistic sources?

The level of danger: Is it *pikuach nefesh* or potential *pikuach nefesh*? Is it merely a slight possibility of danger? Is it perhaps not a danger to life but only to limb?

The motivation of those advocating: Is it purely a health concern? Is it a combination of factors motivating them? Is it purely a *gezeiras hamelech* looking to subvert traditional Judaism?

Based on the interplay of these three factors a halachic authority will decide the Halacha for this exact circumstance; is this specific act prohibited, allowed but not recommended, recommended but not required, or mandated. All of the above options can be potential outcomes, and in some cases different authorities will reach differing, and even diametrically opposed, equally legitimate halachic decisions.

Rabbi Milikowsky is a rebbe and administrator at the Yeshiva of Greater Washington in Maryland. While not a nurse himself, he is married to one for many years and talks about creating an OJNSA for spouses.

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[2] Maimonides, *Mishneh Torah*, *Hilchos Milah* 2:2

[3] See article by Rabbi Yair Hoffman https://vinnews.com/2020/02/26/metzitzah-bpeh-a-deeper-look/ for a history of the controversy in New York City and a discussion of the dispute regarding the statistical danger.

[4] See the Jewish Action, Winter 2007 edition http://ou.org.s3.amazonaws.com/pdf/ja/5767/winter67/24_41.pdf for a relatively contemporaneous debate regarding this question.

[5] Talmud Bavli, Mesechta Sanhedrin 74a

[6] Maimonides, *Mishneh Torah*, *Hilchos Milah 1:18*

[7] Maimonides, *Mishneh Torah*, *Hilchos Milah* 2:8

[8] There are those who dispute the authenticity of this letter from the Chasam Sofer, as it was not included in his published responsa. However, the consensus is that it is indeed a genuine letter. See https://hakirah.org/vol%203%20sprecher.pdf for a full treatment of this question.

[9] https://www.etzion.org.il/en/halakha/yoreh-deah/circumcision/metzitza-ba-peh

[10] See statement from the RCA providinging sources for the various Halachic opinions https://web.archive.org/web/20070415221929/http://www.rabbis.org/news/article.cfm?id=100605

[11] Maimonides, *Mishneh Torah*, *Hilchos Yesodei Hatorah* 5:3

APRN CORNER

Nurse Practitioner Specialty Compensation

By The OJNA Journal Staff

Data released from the Advanced Practice Provider (APP) Compensation and Productivity Survey by Sullivan Cotter indicates that, on average, APP compensation increased by 4.5% in the past year. When broken down by nurse practitioner (NP) specialty, NPs practicing in the neonatal/perinatal arena were the highest earners, making an average of $144,000 annually, while urology NPs brought in the rear making an average $115,000 a year. Other specialities at the top of the range include psychiatric, emergency and hospitalist, and oncology NPs. Gastroenterology, general neurology, and family medicine joined urology at the lower end of the spectrum [1].

When compared to our physician assistant (PA) colleagues, in many of the specialties, PAs appear to earn slightly more than NPs. However, there are some specialties, such as oncology, where NPs seem to earn more [2]. Overall, though, the trend is towards salary growth for all advanced practice providers.

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STUDENT CORNER

Getting Through School with Small Kids

By Serach Goldish

I am honored to write an article for this journal. I debated back and forth and finally decided that I would write about ways and tips I studied for nursing school and the NCLEX with kids. Of course, the very first thing that came to my mind was coffee, coffee, and more coffee. It could have ended there. However, as a single mother of three girls when I embarked on the journey to go back to nursing school, it was not that simple and I had to figure out a strategy that worked for me. My life was at a very different juncture than it had been the last time I was in school.

I am not sure how many of you remember the show Barney, but something that always bothered me about that show was how they had every available center and supply in their classroom, for only about five students. No real classroom functions like that, nor can it exist in reality. I realized when I embarked on my nursing school journey that there is no "one size fits all" method; not for any classroom, any family, any person, and especially not when it comes to studying. So I will try to impart some strategies that worked for me, with the knowledge and understanding that some of these elements will work for you and others will not at all. I hope this guidance will help.

First, some background about me. I received a dual masters degree in education and special education and worked in that field for 14 years. In 2013 I moved with a husband and three kids to a new town away from family and friends. About a year later my marriage fell apart, and I was on my own with three little girls. My divorce was long and drawn out, and by the time it was done, I needed a sustainable way to support my family, and special education was not it. I always knew deep down that nursing was my passion, as I enjoyed helping people and I come from a medical/science family. A friend who is a nurse encouraged me to pursue this dream. I took my prerequisites back-to-back that summer. Unfortunately my plans were derailed a bit and schooling took longer than expected when COVID hit and I had to withdraw for the semester, as my kids were all home from school. Later on, three weeks into my last semester, I had an issue with my RN program and the love, support, and sound advice that I received on OJNA's Facebook page encouraged me to sit for the LPN NCLEX, and that is what I did.

It was a blessing in disguise that I had this fiasco with school because I finished earlier and was able to start studying for the NCLEX earlier than anticipated. I am a goal oriented person, and I wanted to give myself a good two to two-and-a-half months to study. After doing some research, I signed up for Uworld which I found to be a valuable resource and matched my studying style. The last week before the test, I started listening to Mark K and that helped me too. Although you may be bombarded by every nurse that you know on what program you should use to study, remember that you are unique, your brain works differently than others, and what works for others does not necessarily work for you.

I used many of the same studying tips I had used during school to study for the NCLEX. This included setting aside specific times every day or night to study, and including my family in the process. I quite literally sat my kids down and asked for their preference about when I should schedule my study time. During the school year they chose one schedule, and in the summer they chose the opposite. Because they were involved in crafting my schedule, they were good about sticking to it. Not having Mommy present when they got home from camp was hard, but everyone worked together and we made it through. In the summer I got up early, had my coffee, got them off to camp and their jobs, and then drove to Starbucks with my laptop where I sat and did at least 200 questions of Uworld daily. In spite of all my planning, life happens. As a single mother of three girls, I am pretty used to life throwing curveballs at me, and if there was a day that I couldn't finish my scheduled studying, I wasn't hard on myself. G-d has a reason for everything and put me in every situation; He would get me through this. Having a consistent study regimen, but also understanding that not everything goes the way you plan it, and being able to pick up where you left off, is something I had to learn.

In addition to coffee (of course), setting a consistent study regimen, and involving my kids in my study and school schedule, there are a number of other things that helped me through the process. Thanks to the advice of my mom, whenever I had free time, I tried to cook and freeze. It definitely helped so that the night before a test I could just take something out of the freezer and did not have to worry about dinner for my kids.

I know that many of you do not have teenagers. When I started on this nursing school journey my girls were not teens. I know not everyone can afford babysitters or nannies when they are in school. It's really something I only splurged on the night before a test or if I had a lot of studying to do. I am fortunate to have a great core of a few close friends who became my family. Whenever I had a test to take, especially in the COVID era when testing was at home, my friends took my kids. Many times they cooked Shabbos or dinner for me, and my best friend's hitch became my respite every Shabbos afternoon when my futile attempts to study turned into a nap.

I made up for the lack of time with my kids during the week by making sure Shabbos was just us spending time together, even if it

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GETTING THROUGH SCHOOL WITH SMALL KIDS

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meant having them sit down next to me with a book while I studied. I always set aside time, especially on long Shabbos afternoons, to play board games, take walks, and talk to them. I also have a very supportive family who instilled the message into me that I could do this and they were there to help me every step of the way.

Having gone through the things I did after my marriage fell apart, I became closer to G-d and found that to be my respite. I talked, cried, and even yelled to G-d and told Him exactly how I felt. Prayer has been a huge relief for me and a big part of why I felt I made it through nursing school and where I am today. It was Divine Providence every step of the way.

A week before my scheduled NCLEX exam, my mother gave me one of the best pieces of advice I could get. She said, "Why don't you see if you could push your test off a week." I went on the NCLEX website, and did just that. I had already finished all the questions in Uworld, so this last week was dedicated to making a new best friend, Mark K. He explains things in such a cohesive, concise manner and gives such good tips and advice for the NCLEX. I actually enjoyed listening to him and it was the highlight of my mornings.

The following week, on an early Friday morning in July, I went to take the test. I had allotted plenty of time for myself, and I was already scheduled to go to my best friend for Shabbos thinking I was going to come home right before.

Although many people had advised me not to study the day before, that was not advice that worked for me. I replaced my coffee with herbal tea and went to sleep a little earlier than usual the night before too.

My test had 75 questions, some seeming very random or focused on culture, and there were not that many medication based questions. I left the test feeling defeated. I called my mother and told her I had failed and needed to sign up to take it again. But I drove to the local gas station, bought myself a gift card and did the Pearson U trick. It had said I passed, though I didn't believe it. Sunday morning I got the early results: I had passed and was officially a nurse in the states of Ohio and Florida.

A quick review. There's no one-size-fits-all; everyone has different studying tips that work for them. Coffee is a game changer, but so is a good night's sleep, so find a balance between the two (I would highly recommend half decaf pods by Nespresso). Include your family in the studying process, have them pick what works for them in terms of family time, but be consistent about studying time really being studying time. Have a studying regimen and stick to it, but remember that life happens, mommyhood happens, and adulting happens. If you miss a day, just pick yourself right back up. There is always tomorrow.

NURSES TO KNOW

By Tziporah Newman, BSN, RN

Michelle Jacobson-Malek, RN

Infection Control Nurse

Briefly share your professional career up until this point and how you entered into infection control.

I worked for 23 years as a pharmacist in a long-term care state facility up until it closed. At that point, the pharmacist market was flooded, and I did not have many employment opportunities, especially with some of the limitations of being an Orthodox Jew. Nursing was a career I considered before attending pharmacy school. I completed my Associates Degree in Nursing in 2019 and started working in an adult medical daycare. Several months later, I started as a bedside nurse at an acute care rehabilitation hospital. I am currently pursuing my MSN in Clinical Research at Montclair State University. After one year at the bedside I was offered the opportunity to take the vacated infection control nurse position.

Did you have a specific area of nursing that you wanted to pursue?

I was undecided when I finished school, but I knew working at the adult medical daycare would not be something I would do long term. I wanted to transition to a position that would expand my skills.

Can you describe the day-to-day tasks of an infection control nurse?

Infection control involves surveillance, data analysis, and education. I track any infections that arise, review lab reports, and make sure antibiotic coverage is appropriately ordered. Whenever a patient tests positive for an infection that requires isolation precautions, I ensure that the correct isolation status is ordered and that the correct signage is placed outside the patient's room with availability of the necessary personal protective equipment (PPE). The hospital's physicians consult with me to determine when a patient can safely be removed from isolation. Our hospital does not have an employee health nurse, so I am responsible for tracking employee absences related to infectious diseases and determining when it is safe for them to return to work. I submit the required daily report to the State of New Jersey for COVID-19 cases among patients and employees, and I am responsible for submitting monthly data to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network about any hospital-acquired catheter associated urinary tract infections (CAUTI) or Clostridium difficile infections.

I provide education about infection control to all new employees as well as provide ongoing education and in-services. I perform various audits including proper hand hygiene, proper donning and doffing of PPE, monitor that shared equipment is disinfected between patients, and make sure equipment and supplies that have to be dated, such as oxygen tubing and IV tubing, are properly dated. I audit the clean supplies and medication rooms to ensure no expired products are being used.

I assess equipment that may lead to risk of infection, such as tears in mattresses or rips in the weights in the therapy gym. The kitchen has many areas that are infection risks, so I make sure all food is being stored properly and monitor daily temperature and cleaning logs.

Do you find that your experience working during the COVID-19 pandemic helped shape you into a more efficient infection control specialist?

It most definitely did. I began my infection control role when the first COVID-19 vaccines became available. Interestingly, the most difficult period of my job has been during the emergence of the Omicron variant. During the highly contagious wave, we had a high number of staff and patient cases, and keeping accurate records of the cases as well as contact tracing required me to be extremely well organized and thorough. There were days that I worked 16 hours fielding employee calls, updating administration, and completing documentation. Some of those days occurred while I myself was home sick with COVID-19. Many issues had to be decided quickly, for example canceling visitation and reopening a COVID-19 unit.

How do you see the specialty evolving having just experienced COVID-19, monkeypox, polio, and Ebola virus outbreaks all within the past two years? Have you seen any changes in the past year since becoming an infection control nurse?

We learned that during the pandemic there was an increase in hospital-acquired infections of central-line associated bloodstream infections (CLABSI), catheter-associated urinary tract infections (CAUTI), methicillin-resistant Staphylococcus aureus (MRSA), and ventilator-assisted events (VAE). There has also been an increase in extended spectrum beta-lactamase urinary tract infections (ESBL-associated UTIs). I am happy (and grateful) to see there has been an increase in MSN programs that offer an infection control specialty. Infection Control nurses are now more frequently called infection preventionists, and prevention of infection is vital to the safety of patients and staff. This advanced degree will help better prepare nurses who wish to enter this important nursing specialty. I recommend training with a nurse certified in infection control. This was something I was able to do and benefited tremendously from.

Have you encountered any difficulties within the parameters of your job due to the fact you are an Orthodox Jew?

The hospital that I work at is very accommodating as the bedside position was night shift, and I was hired on the condition that I work every Sunday night. I was always flexible to come in after Shabbos if they were short staffed. Yom Tov is never an issue as I make sure to give advance notice of the days I will be unavailable.

If you would like to be profiled in future issues of The OJNA Journal, send a short paragraph detailing your background and role to info@jewishnurses.org.

CAREERS TO CONSIDER

Infection Control Nurse (ICN)/Infection Preventionis

Tziporah Newman, BSN, RN

Job Description/ Basic Responsibilities [1-3]

- Work collaboratively with doctors, epidemiologists, infectious disease specialists, public health officials, government agencies, and microbiologists.
- Assess for infectious patterns involving bacteria and viruses, analyze data, create plans to contain and prevent outbreaks, and communicate efficiently with all necessary providers. This can include making sure the correct antibiotics are being used for the susceptibility of the bacteria.
- Create and update policies and procedures that reflect the latest evidence-based practices.
- Educate and review, as well as provide inservice training, regarding policies, procedures, and techniques to all staff. This may include observing staff and daily operations in the clinical setting.
- Ensure the correct isolation precautions are in place if necessary, the correct proper protective equipment is being used, proper hand hygiene techniques are being used by all staff, and proper cleaning procedures for all equipment and supplies are being used in between patients.

Educational Requirements [1, 3-4]

- Requires at least an Associate Degree in Nursing (ADN) and an active RN nurse license.
- Master's in Public Health (MPH) is not required. However, the knowledge and information would be invaluable.
- Certification through The Certification Board of Infection Control & Epidemiology, Inc. (CBIC)- Certification in Infection Prevention and Control (CIC)
    - Must have ADN
    - Have worked a minimum of 3,000 hours
    - Not required but preferred by employers
    - Renew yearly

Recommended Experience [2-3]

One year experience as a nurse is strongly encouraged.

Salary [5]

$60,000-$105,000 with an average pay of $77,048. Pay varies based on experience.

Work Environment [2-3]

Infection control nurses work in hospitals, long-term care facilities, outpatient centers, home care agencies including hospice services, and in public health agencies,

Job Outlook [2-3, 6]

A recent study analyzing significant serious global outbreaks over the last 400 years found that due t an increase in zoonotic diseases and climate change, there is a strong probability of multiple extrem outbreaks over the next few decades. Based on this information, the need for infection preventionist is likely to increase.

Suggested Skills [2-3]

- Thorough
- Analytical
- Responsive
- Efficient
- Proactive
- Good and clear communication
- Stay up-to-date on all the latest research and recommendations
- Readily available for questions, concerns, and guidance should a scenario present itself

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Member Milestones

TO HAVE YOUR MILESTONE FEATURED IN OUR NEXT JOURNAL, SCAN THE QR CODE HERE AND FILL OUT THE FORM!

SARAH BRACHA COHEN, MSN, RN, graduated with her Master of Science in Nursing (MSN) with a concentration in clinical nurse leadership from University of Maryland in 2017. She passed her Clinical Nurse Leader certification in November 2022. After a year of travel nursing, Sarah Bracha moved to Miami and began working in the mother-baby unit at Jackson Memorial Hospital in January 2023.

YEDIDYA DEAR, BSN, RN, CSN, was nominated for the Daisy Award in December 2022. He currently works as an ICU and home care nurse in Texas.

SHEVI ROSNER, MSN, RN-C, works as NICU nurse and an adjunct professor. While already certified in pediatrics, she obtained NICU certification in January 2023.

ZACHARY ROTHKE, BSN, RN, graduated from Felician University in August 2022 and started a job in the pediatric cardiac ICU at NYU Langone.

ROBERT DAVIS, MBA, MSN, RN-BC, NE-BC, NHDP-BC, EMT-B, was appointed as Chair of Content Expert Panel for the Nurse Executive Certification Exam by the ANCC effective January 2023. The Chair of Content Expert Panel reviews panel experts and approves all questions for the exam.

REBECCA (RIKKI) FELDMAN, MSN, RN, became certified as an American Heart Association instructor of ACLS, BLS, Heartsaver, and community CPR /first aid in December 2022. She offers classes within the tri-state area.

CHAYA MILIKOWSKY, MS, RN, AG/ACNP, works in inpatient hospice, but after a few months away from the ICU realized that she really missed the dynamism of the critical care environment. As of November 2022 she has taken an additional PRN job as a nurse practitioner in the medical ICU at University of Maryland Medical Center in Baltimore.

OJNA BOARD LEADERSHIP UPDATES:

The board members of the OJNA continue to work on organizational growth and development, fundraising, strengthening OJNA committees, and growing our reach across the United States, Canada, Israel, England, and beyond. The organization continues to grow in membership, expand and improve member resources and services, and host virtual and in-person events.

Community Engagement

OJNA president Toby Bressler, PhD, RN, OCN, FAAN, represented OJNA at "The Mesorah of Women in Medicine," an event hosted by Ezras Nashim on November 22. This event featured prominent frum women such as the Honorable Ruchie Freier, Allison Josephs, Avital Chizhik-Goldschmidt, as well as a representative panel of frum women in a variety of healthcare roles. The well-attended event was held in New York City.

Chapter Events

After a few months of quiet, many OJNA chapters rallied for Chanukah events. On Sunday December 18, our Texas chapter held a Chanukah party for OJNA nurses and their families organized by Eliah Perez. The group had over 65 attendees, and they enjoyed donuts, latkes, and great camaraderie.

Our Philadelphia chapter held a social get-together at the home of Deena Pack on Tuesday, December 20. The event featured food from Espresso Cafe, and our nurses all enjoyed each other's company and Chanukah spirit. Thank you to Malka Feibush for making this event happen!

On Wednesday, December 21, Raina Leon hosted a chanukah event at her home for our Chicago nurses, and finally on Thursday, December 22, our Florida chapter had their own Chanukah party at the home of Rachel Gittler, organized by Sarah Bracha Cohen. Thank you Raina and Sarah Bracha for organizing your respective events.

Although chanukah ended in December, OJNA's New Jersey chapter chose to host their local event in early January. In addition to delicious food and great company, they invited Dr. Shari Bloomberg, LCSW, to speak to their nurses about "Finding balance in the everyday: Making time for ME." Thank you to Laura Silverstein for organizing this event.

We encourage our other chapters to arrange events of their own. Remember, OJNA can help with planning, funding, advertising, and logistics. If your area does not have an OJNA chapter yet, reach out to us at info@jewishnurses.org to become your local liaison!

Education

On December 28th, our members were given the opportunity to learn from Julie Rubinstein, RN, CDE, about non-insulin diabetes medication. The virtual attendees all really enjoyed the talk on this topic that we all come across on a regular basis and were able to earn 1 CE credit from the comfort of their homes. The attendees all expressed a desire to hear from Julie again in the future, and we look forward to offering more classes from her as we move forward.

Florida Chanukah Party

Philly Chanukah Party

The Mesorah of Women in Medicine

Texas Chanukah Party

NJ Chapter Event

Chicago Chanukah Party

ORTHODOX JEWISH NURSES ASSOCIATION

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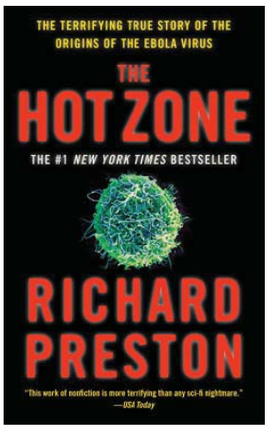
OJNA RECOMMENDS: BOOK PUBLICATION

The Hot Zone

Author: Richard Preston
Book review by OJNA Journal Staff Writer



Fast-paced and frightening, *The Hot Zone* by Richard Preston reads like a thriller, but it is in fact based on true events occurring in the late 1980s. The book describes the emergence of a deadly strain of filovirus, thread-like viruses that include in their ranks notable viruses like Ebola and Marburg, in a monkey holding facility in Reston, Virginia. As large numbers of monkeys begin to die of an unidentified disease, alarms are raised. Samples of the monkey tissue appear to harbor "spaghetti strands" of virus similar, if not identical, to the highly infectious and fatal Ebola Zaire virus that kills nine of its 10 victims with stunning rapidity. The U.S. Army, and specifically the United States Army Medical Research Institute of Infectious Diseases (USAMRID), takes over the containment of the virus and the responsibility for preventing a massive outbreak. The Centers for Disease Control and Prevention (CDC) is involved as well, and Preston highlights the tensions between the different agencies. Veterinarian couple Nancy and Jerry Jaax are key players in the tale, with Nancy involved in narcolepsy of the dead monkeys to identify the disease, and Jerry taking responsibility to destroy the hundreds of monkeys that have been exposed and are ticking time bombs of the explosive virus. The virus is ultimately found to be a new form of Ebola, coined Ebola Reston, that for reasons unknown do not cause death in humans, and after destruction of the facility, the virus fades back into the shadows.

In addition to dramatizing the events surrounding the Reston monkey facility outbreak, Preston provides context for the outbreak by depicting earlier appearances of the deadly filoviruses, their rapid and grotesque destruction of their human hosts, and theories about where and how these viruses jump into the human race and start replicating. These discussions are not clinical or dry; Preston personalizes the tale through the eyes of those involved, making these characters come to life and leaving the reader feeling as though he is watching a horror movie. We watch the characters move from everyday life in their African home—a French expatriate visiting Kitum Cave for New Years, a nurse traveling from her rural hospital to be examined in a larger hospital—to experiencing the ravages these deadly diseases exert in which their organs liquify, their blood coagulates and hemorrhages, and in which their personality and mentation slowly deteriorate.

The book is written for a general audience, and for those who do not have a medical or scientific background; the information provided is grotesque, detailed and more than adequate. For our particular audience, with a better understanding of viruses and infectious diseases than the general population, there may be parts of the writing that appear oversimplified and overdramatic. I first read this book as a teenager and was both fascinated and horrified at the specter of a killer virus gone rogue much like *The Andromeda Strain* by Michael Crichton. Reading the book again, this time as an adult and healthcare provider, and in the setting of a recent worldwide pandemic, I did at times sense that there were missing elements to the tale and perhaps a less than nuanced approach, but overall I still found the book highly engaging, enjoyable, and yes, still terrifying. Preston anthropomorphizes viruses in a way that makes them seem like sinister and ruthless villains, when ultimately they are nothing more than lifeforms doing exactly what they were created for, the continuity of their species, but as a writing style this does make the book a chilling and easy read. For a reader who loves a page-turner—with the added benefit of being based on reality—I would highly recommend this book. More than anything else, this book reminds us that "truth really is scarier than fiction".

MUSINGS

Perspective From the Other Side

By Laura Silverstein, MSN, RN

I have worked in home care for the past 15 years. In that time I have worked with many patients and their families. The patients are all different, of course. But the family members and caregivers seem to all fall into four groups.

- The completely disinterested and/or uninvolved family
- The super involved son
- The family member or friend that is trying to help and is doing their best but cannot really do much
- The super involved daughter/mother/wife

The completely disinterested and/or uninvolved family:

This group always makes me feel so bad, and glad that I have a lot of children who will (hopefully) take care of me when I am old. I try to imagine what it must be like to be the patient who has no one, and then I try to imagine what the family must be thinking. It is hard to justify, but I know there are some possible reasons why the family cannot or will not get involved. Maybe the family has significant issues in their own health or their childrens' health? Maybe they do not have a healthy relationship with the patient and cannot overcome the past? Maybe they have tried to help and the patient has reacted badly, ungrateful, or even abusively? Maybe they do not know how to navigate the healthcare system and it is too overwhelming to help if they do not know how?

In these situations, I really pray for these patients. We all know that the healthcare system today requires a very strong advocate for the patient, and if there is no one to provide that advocacy or support then the patient always suffers.

The super involved son:

In my experience, this caregiver is usually an only child, therefore all of the responsibility falls on this son, as there is no one else but him. I have found that this caregiver often goes "overboard" in his care or follow up possibly because nurturing is new for him or does not come naturally. The son does his best, and often does a great job in caring for his parent or parents. I always make sure to thank the son, and remind him how lucky his parents

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are to have him as an advocate. I also always empathize with his position, acknowledging how much work caregiving is. I appreciate that this son is "doing the right thing" even though he may not know how.

The family member or friend that is trying to help and is doing their best but cannot really do much:

This is often a distant family member, neighbor, or ex-spouse. This caregiver never anticipated being the caregiver, but knows that the patient has no one else. They have their own families, and often, their own elderly parents or family members that need care. This caregiver has fallen into this role usually unexpectedly and is trying to help. My expectation from this caregiver is often minimal, given the relationship. Sometimes I am surprised, especially with the ex-spouses, when this caregiver becomes the primary caretaker and contact person. It is heart-warming to experience, when a distant family member or non-family member takes the huge responsibility of caregiving.

The super involved daughter/mother/wife:

This is both my favorite and least favorite group. These caregivers are relentless. They demand the best of everything. They insist on the highest care, frequent follow up, and instant responses. They ask for outrageous accommodations and seem to have all the time in the world to support, care for, and advocate for their loved one. They escalate requests and file complaints and grievances. They are relentless. Do NOT get in their way or try to avoid them. They will find you. These women are the champions of their loved ones, and they will not let anyone stop them.

I speak with these daughters because their calls get escalated to me after other people in other departments may have been unsuccessful addressing their concerns or solving their issues. Even when the Super Involved Daughter is yelling at me about something, I remind myself that she is advocating for her parents in a way that we should all be so lucky to have to advocate for us. I try (hard) not to feel bad or take it personally, but when she is (criticizing) speaking with me, I take excellent notes so I can appropriately recap the conversation, promise follow up, and (hopefully) deliver.

I recently met a Super Involved Daughter in person when she was visiting her mother. We chit-chatted and I wondered how she would react to me in person since her calls and emails always have an indignant tone. She thanked me for taking care of the things she had requested and expressed her gratitude for my responsiveness and ability to "get things done." I felt like I had won the lottery. There is no greater gift than being thanked by a Super Involved Daughter.

I have always personally identified with the Super Involved Daughter. I come from a long line of strong women. There is not one shy, timid or meek woman on my family tree. I am an excellent advocate for my patients, staff, children, and family members. I have often imagined myself as the Super Involved Daughter one day in the future. I also imagined myself being very understanding of the healthcare teams and not making unrealistic requests. Since I was familiar with the healthcare perspective I knew that I could be the model Super Involved Daughter.

That day came sooner than I expected when my 81 year old father-in-law got hit by a car crossing the street in Brooklyn last month. He and my mother-in-law were packed and ready to go to Florida for the winter, leaving the next morning. My in-laws are in their 80s but were completely independent except for my mother-in-law's bad knee that she was planning on having replaced this winter. My father-in-law went to the gym every day. They were in great shape in both body and mind.

My husband called me at work and asked me to meet them at the emergency room since I was nearby in Brooklyn and he was already home in New Jersey. I met them at the ER, and my father-in-law assured me that he felt "completely fine" and wondered if they could still make their flight in the morning. He looked fine, but I know how this works (I was once hit by a car and also refused medical treatment because I was "completely fine," not a good choice). My sisters-in-law were on their way from Long Island, but I assured my husband that he could stay home and I would call him if I needed him.

I encouraged my father-in-law to get checked out and I asked the staff to order X-rays. They felt he did not need them because he was not in any pain, but I insisted and they relented. They came and gave him a tetanus shot and rolled up his sleeve and we found blood and abrasions all over his arm. No one had examined him, so we did not know he had fallen on his arm as well.

My sisters-in-laws watched as I continued to argue with the staff. They finally agreed to X-ray his ankle, I asked for additional leg X-rays and the nurse asked me, "What do you want me to do, X-ray his whole body?" I stayed calm and asked for additional X-rays to rule out serious injuries. I was also able to eventually convince the doctor to agree to do a head CT and a pelvic X-ray. My father-in-law, still not in pain, felt weakness in his leg and no longer "felt fine." I asked several times for pain medication but was pushed off and ignored. After repeated requests they finally gave him some Tylenol.

Finally, after waiting almost six hours to get all of the results, my father-in-law was cleared for discharge. They diagnosed him with a broken ankle and went to wrap his leg in a brace. He had several abrasions that were very raw. I suggested a non-stick dressing under the brace so it would not hurt when it was changed. They argued that it was not necessary but eventually agreed. At this point I called my husband and asked how his parents were going to get from the street across the courtyard to their apartment building and then up the three steps to the elevator. I asked him to come, since the hospital had already advised my father-in-law not to bear weight on his broken ankle.

In transferring him into a wheelchair to take him home, he had what appeared to be a seizure. The nurse looked at me and I looked at her and told her to bring him back into the ER. We waited several more hours to see a doctor who seemed unconcerned since his head CT was clear, his vital signs were normal, and he had no deficits. I encouraged them to admit him because no one knew why he had a seizure and he had no history of seizures, but it was denied.

They discharged him after eight (!) hours in the ER with an ankle fracture and crutches. Crutches??? I asked the discharging nurse what we were supposed to do. He could not walk, could not transfer, and had steps to get into his apartment building. She shrugged and offered no suggestions.

My amazing husband carried his father into his apartment and I looked at my sisters-in-laws and mother-in-law and said that my husband should stay for the night. By the next morning we had learned all about no fault insurance, and how little I knew about orthopedics. Luckily, I knew someone and things started to fall into place. It really is who you know. Without my connection (Thanks Ahuva!) I would have been lost. The orthopedics practice that we got him an appointment with was near our home in New Jersey.

It became clear very quickly that my in-laws would be best cared for in New Jersey. I encouraged (insisted) that my in-laws pack their

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PERSPECTIVE FROM THE OTHER SIDE

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bags and move into our house. The orthopedist was local to us and we have a first floor bedroom. Granted, we have six steps outside our house and no first floor accessible shower, but it really seemed like the obvious choice.

The final diagnosis was ankle fracture, tibial fracture, fibula fracture, and torn meniscus. Surgery was scheduled for after Thanksgiving and we were prepared for 12 weeks post-op non-weight bearing status.

My sisters-in-laws procured a wheelchair from the local Bikur Cholim. It was a lifesaver. I have no idea what we would have done without it while we were figuring out how to get other medical equipment and supplies.

I put on my Super Involved Daughter hat and got started.

Commode, wheelchair, walker, urinal, transfer board, check.

Chux, bed bath supplies, waterless toothbrushes, check.

I cut my father-in-law's toenails, cleaned his legs, encouraged him to drink when he was disinterested, and managed pain meds.

Ambulance transportation arrangements, home care referrals, check.

Home care is my "thing," so I felt prepared.

The day of the surgery and the day of the hospital discharge was a saga of unforeseen and avoidable challenges. We arrived at the time we were told and then we were informed that we were too early. Then we were told that my father-in-law was supposed to have another COVID test that we were not aware of. Then they told us we could not stay until the surgery, even though we were told before that we could. And on and on.

After the surgery started I called the hospital to arrange for the ambulance transport the following day and start the home care admission process. I was told I could not make those arrangements because my father-in-law was not admitted yet. So I left messages throughout the morning and afternoon for the discharge planner, but no one called me back. When I was finally able to speak to the discharge planner she said that she would make sure that the arrangements would be made and I could follow up with her tomorrow.

I called the discharge planner the next day and left several messages but she did not call me back. Finally, I called the general discharge planning department and was told that the discharge planner was out of the office and the covering person had no idea what I was talking about. Of course it was a short Friday and we wanted to take care of things quickly. I requested an ambulance transport for discharge and a home care referral and was told the requests would be processed. It took all day of phone calls and practically begging to get the ambulance confirmed. After being cleared by the surgeon at 10 a.m. my father-in-law was finally discharged and taken home in the ambulance at 3 p.m. (!).

This is only the very beginning of our journey. I am happy to report that I have not yelled at anyone (although I wanted to) and have genuinely tried to see things from the "other side" during my interactions with the healthcare teams. I am also happy to report that I have interacted with many amazing healthcare workers who have gone above and beyond to ensure my father-in-law's comfort and the comfort of his family.

This process has given me incredible perspective and, in only a very short time, has helped me provide more empathetic care with kindness and patience that I did not possess two months ago. Not for the first time in my nursing career I wondered what else I could do to be a better nurse. What else have I been missing? I suppose it is human nature to best associate with situations you have personally experienced. But how can we facilitate a deeper understanding of other people's pain and suffering without enduring them ourselves?

Laura J. Silverstein, MSN, RN, WCC, CDP, is the Director of Patient Services for a multi-regional licensed home care service agency and has worked in many home care settings over the past 15 years. Laura enjoys writing about her patients and her experiences with them and is dedicated to learning something from every situation, good and bad. Laura lives in New Jersey, where she dedicates her free time to several hobbies, including her gown gemach, volunteering at her shul, reading, quilting, her seven children, and her very patient husband.

CASE STUDY

Reactivation of Hepatitis B

By The OJNA Journal Staff

Patient Presentation: BA is a 54 year old female who was brought to an outside hospital (OSH) after being found down in a hotel room. She was confused and did not recall the events of the prior few days. In the OSH, she was noted to be jaundiced and labs showed acute liver failure. She also had low platelets and an elevated WBC count. Her vital signs showed tachycardia, tachypnea, and hypoxia for which she was placed on bipap. She was transferred to University Hospital as it is a transplant center, for evaluation for a possible liver transplant.

History: BA was hospitalized two months prior, where she was noted to have a very low platelet count. She underwent a bone marrow biopsy and other workup, and was diagnosed with Idiopathic Thrombocytopenic Purpura [ITP]. She was given steroids, a course of IVIG, and was put on Promacta (eltrombopag) without a significant response. She discharged herself from the hospital before workup and treatment could be completed to attend her mother's funeral.

Shortly after arrival to University Hospital ICU, the patient's mental status declined. Her breathing was fast and labored, and she required increasing amounts of oxygen via high flow nasal cannula to maintain saturations of >92%.

Past Medical History: Chronic hepatitis B (untreated), bipolar disorder, anxiety, depression, substance abuse

Past surgical history: Anterior cervical discectomy earlier this year

Family history: Unknown, is estranged from her three children

Travel history: No recent travel outside of the country

Social history: History of prior drug use (cocaine, marijuana, others) but denied current drug use. Patient's brother however expressed concern that her recent behaviors appeared to suggest that she had relapsed and was using drugs.

Home medication: BA could not endorse taking any medications. She has a history of non-compliance with medications. Home medication list includes amlodipine, eltrombopag, hydrochlorothiazide, losartan, mirtazapine, protonix, prednisone, and tramadol

Examination:

Neuro: altered mentation with waxing/waning orientation, delayed speech

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HEENT: icteric sclera, scleral edema

Pulm: tachypnea, clear breath sounds bilaterally, increased work of breathing, requiring oxygen via high flow nasal cannula to maintain saturations

CV: tachycardia, palpable peripheral pulses, no edema, cap refill <3 seconds

GI: abdomen large, soft, nontender, nondistended, did not appreciate organomegaly

Skin: jaundice, bruising bilateral lower extremities

Investigations:

- Chest XR showed bilateral pulmonary infiltrates, ground-glass opacities
- Echocardiogram showed right ventricle dilation, hyperdynamic left ventricle
- Significant aberrations on labwork: elevated LFTs (both AST/ALT>1500), elevated bilirubin (8), elevated amylase (457), elevated WBC (30), decreased hemoglobin (8), severely decreased platelets (10), elevated troponin (2), elevated CK (2400), elevated BUN/creatinine (52/2.02) among others
- Urinalysis was negative for infection

Differential diagnosis:

- Drug induced liver injury
- Reactivation of chronic hepatitis B
- Pancreatitis (elevated amylase and lipase)
- ARDS (possibly from pancreatitis)
- Diffuse alveolar hemorrhage (hypoxia, anemia, thrombocytopenia)
- Sepsis
- Pulmonary embolism (RV dilation, tachycardia, hypoxia)

Discussion: BA was intubated in light of worsening mentation, work of breathing, and hypoxia. She subsequently became hypotensive and required central line and arterial line placement and the initiation of vasopressors. Her renal function continued to deteriorate and she was started on continuous renal replacement therapy (CRRT). Platelets were transfused but her platelet count would not recover. It would go as low as 1.

Continued investigations:

- Blood cultures remained negative
- CTA showed no pulmonary embolism. A later CTA showed widespread infarcts that include splenic and renal infarcts, and non occlusive left radial artery thrombus
- Bronchoscopy with concern for Pneumocystis Jirovecii Pneumonia (PJP)

Discussion: BA was eventually able to be extubated and weaned off pressors. She developed dry gangrene of her toes bilaterally, and the fingers and distal hand on the left, probably due to long-term pressor use, but also in the setting of a left radial thrombus possibly induced by aline placement. She continued to require dialysis for her kidney function, though was able to be transitioned from CRRT to intermittent hemodialysis. Her liver function tests improved somewhat, but she is still in liver failure and theoretically would require liver transplant. She is currently not deemed a candidate for liver transplant due to underlying social issues, substance abuse, lack of family support, as well as persisting severe refractory thrombocytopenia.

Treatments: BA has undergone many treatments for the array of issues she is dealing with:

Possible septic shock: completed courses of vancomycin, zosyn, and micafungin

PJP pneumonia: clindamycin and primaquine (although Bactrim is the antibiotic of choice for PJP pneumonia, there was concern that it was exacerbating her severe thrombocytopenia)

Acute renal failure: received CRRT while hemodynamically unstable, then intermittent HD

Reactivated hepatitis B: completed a course of NAC (N-acetylcysteine) when she first arrived, now remains on tenofovir

Severe thrombocytopenia: received frequent platelet transfusion without benefit so is no longer being transfused, except in the case of severe bleeding. BA received steroids, IV immunoglobulin, and plasma exchange (PLEX) with no evidence of improvement. She has received romiplostim (medication to stimulate platelet productions) and continues to be worked up by rheumatology and transfusion medicine

Discussion relevant to the topic of infectious diseases:

Reactivation of hepatitis B: Hepatitis B is caused by the hepatitis B virus (HBV), and is spread through blood and body fluids. It is most commonly spread through mother to infant transmission during birth, by needlesticks, or through sexual contact. Most people do not manifest any symptoms when they become infected, but some people do develop acute hepatitis with symptoms of jaundice, fatigue, nausea, vomiting, and abdominal pain. Only a small percentage of immunocompetent people who develop an acute HBV infection progress to chronic HBV. For those who do develop chronic HBV, evidenced by persisting hep B surface antigens at more than six months post-infection, there are many factors that determine whether they need long term treatment versus whether they should adopt a "watch and wait" strategy. People with chronic HBV are at risk of developing cirrhosis and hepatocellular carcinoma, and for the potential of acute HBV reactivation [1].

HBV can be prevented with childhood vaccinations. For those who already have chronic HBV, they may be treated with antivirals such as tenofivir or entecavir. These antivirals do not cure HBV, but they do slow the progression of the disease. People with chronic HBV should avoid medications that can damage the liver, such as acetaminophen, and should also be conscious about maintaining good nutrition and adequate hydration [1].

HBV reactivation describes the sudden reappearance of HBV DNA in a person who previously had an inactive or resolved HBV infection. This may manifest solely as the abrupt and marked increase in HBV DNA, or it may manifests with an increase in liver enzymes (AST and ALT) and can be associated with symptoms of acute liver failure such as jaundice, abdominal pain, nausea and vomiting, altered mentation, and ascites. Some common triggers for the reactivation of HBV include starting immunosuppressive treatments such as steroids or chemotherapy. In the case of BA, it is thought that the steroids she was given in the hopes of treating her ITP may have reactivated her HBV and caused her fulminant liver failure [2].

Final outcome: BA remained hospitalized in the ICU with ongoing discussions with palliative care. Shortly after drafting this case study, BA decompensated with widespread bleeding, fever, encephalopathy, and hemodynamic compromise. She was intubated, placed back on vasopressors, and bleeding was managed with PRBCs, platelet and FFP transfusions, vitamin K, and DDAVP. Lactate was >10. Her dialysis was changed back to CRRT. She remains critically ill, in multisystem failure. She remains a full code.

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MEET THE TEAM:

Chaya Milikowsky, MS, AG/ACNP-BC, RN, received her Master of Science in Clinical Nurse Leadership from the University of Maryland School of Nursing in 2010, after which she went directly into critical care nursing. In 2015 she earned a post-master's certificate as an Adult/Geriatric Acute Care Nurse Practitioner and Clinical Nurse Specialist from the University of Maryland School of Nursing. She splits her time between working for inpatient hospice and the MICU at University of Maryland Medical Center. She lives in Silver Spring, Maryland, with her husband and children.

Tobi Ash, MBA, BSN, RN, received her Bachelor of Science in Nursing from Barry University in 1998, her Master of Business Administration from Nova Southeastern University in 2001, and is completing her Ph.D. at Walden University. Tobi is the Director of Women's Health Care at Nano Health Associates in Miami Beach. She is a member of Sigma Theta Tau International Honor Society of Nursing and served the nurse position on the Health Care Advisory Committee for the City of Miami Beach for two consecutive terms. She sits on the boards of the Greater Miami Jewish Federation, LimmudMiami, EMES Initiative, NCSY Southern Region, Miami Beach Garden Club, and Helping Hands, and is the former chair of Ohel South Florida Advisory Board. She lives in Miami, Florida.

Dina Bressler, BSN, RN, WTA, graduated from Touro College's Nursing Program in June of 2020. She currently works in Brooklyn, New York, as an Assistant Nurse Manager for the Mount Sinai Health System while pursuing her MSN/MBA degree at the Johns Hopkins School of Nursing and Carey School of Business.

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