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Managing the sexually transmitted disease pandemic: A time for reevaluation

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The serious implications of the sexually transmitted disease (STD) pandemic that currently challenges educators, medical practitioners and governments suggest that prevention strategies, which primarily focus on barrier protection and the management of infection, must be reevaluated and that initiatives focusing on primary prevention of behaviors predisposing individuals to STD risk must be adopted. Human immunodeficiency virus/acquired immunodeficiency syndrome, human papillomavirus, genital herpes, and *Chlamydia* are used to illustrate the pervasive presence of STDs and their serious consequences for individuals and national infrastructures. Long-term sequelae are discussed, including the emerging link between various sexually transmitted infections and cancer, and the psychosexual and psychosocial factors which impact infected individuals. Although risk reduction and treatment of existing infection is critical, the promotion of optimal lifelong health can be achieved most effectively through delayed sexual debut, partner reduction, and the avoidance of risky sexual behaviors.

The challenge of dealing with sexually transmitted diseases (STDs) and their sequelae is an increasing concern for medical professionals and public health officials as they struggle to deal with the swelling pandemic. Although the medical literature documents the insidious escalation of these infections in populations throughout the world, many health providers are confronted, on a daily basis, with the potentially devastating short- and long-term consequences of STDs in the lives of ordinary people. Health professionals, educators, and policy makers have promoted strategies that focus on risk-reducing barrier protection as well as disease management. The lack of impact on STD rates and the enormous personal and societal consequences of these infections make it imperative that primary prevention strategies, which focus on underlying problem behaviors, become a focus of prevention programs. In this article, 4 prevalent STDs will be discussed to illustrate the pervasive impact of this public health challenge; special concerns related to the sequelae of STDs and their vertical transmission will be highlighted; and, because the majority of these infections

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occur in teenagers or young adults, 2 approaches to dealing with STDs in this population will be explored.

The pervasive menace of STDs

Although STDs have profound impact on individual sufferers, it is important to assess the global and societal impact of these diseases to appreciate the urgent need to reevaluate current management strategies. In the following discussion, current research about human immunodeficiency virus and acquired immunodeficiency syndrome (HIV/AIDS), human papillomavirus (HPV), herpes simplex virus (HSV), and *Chlamydia* will be reviewed and their significant impact on individuals and population groups will be highlighted.

HIV/AIDS

Although there are many STDs that dramatically affect the lives of individuals, none has attracted so much attention in both medical and lay publications over the last 10 years as HIV/AIDS, "the most complex problem facing humanity today."[1] This infection, the second leading cause of serious sickness and disability in the world,[2] is contracted most commonly by those aged 15 to 25 years[3] and, with an estimated 14,000 people infected every single day, a recent medical article stated "despite the impressive advances in medicine since [the 14th century], HIV/AIDS is likely to surpass the Black Death as the worst pandemic ever."[4] Recently published figures clearly reinforce previous warnings that civil order as well as economic and infrastructure sustainability in some developing countries is severely threatened by widespread HIV/AIDS infection.[5]

Although the tragedy of AIDS in Africa is well documented, the potential for widespread political and social impact by STDs is also evident in other regions of the world: increasing STDs rates in Eastern Europe and Asia raise serious concerns.[5-12] It is anticipated that the next wave of HIV/AIDS infection will be in the 3 largest countries of Eurasia—Russia, India, and China—and it has been hypothesized that burgeoning HIV/AIDS infection in this region of the world "threatens to derail the economic prospects of billions and alter the global military balance."[13] It is critical to remember that although this STD has the potential to dramatically impact demographics and thus the political integrity of nations, there is another, equally important perspective: "AIDS does not threaten to destroy a great horde of faceless people—it is far worse. It is destroying lovely, interesting, vibrant, and extremely valuable individuals, one at a time, relentlessly."[14]

Although the urgency associated with AIDS appeared to have decreased in the mid 1990s as combination drug treatments both prolonged the lives of people with HIV and heightened hopes that this would become a chronic rather than terminal illness, increasing worldwide rates of HIV/AIDS have recently brought this impending health disaster into sharp focus. Although clinical trials of HIV vaccines may offer hope for achieving some degree of protection from this virus in the future, testing is in the early stages and there is danger that a false sense of security will be engendered if individuals begin to believe that an effective vaccine is imminent. Despite considerable efforts and resources devoted to HIV/AIDS risk reduction, the Joint United Nations Program on HIV/AIDS (UNAIDS) recently announced that the pandemic is only in its early phases.[1]

HPV

HPV is the most widespread sexually transmitted infection in many parts of the world. It is thought to be the most common STD in the United States and the US Centers for Disease Control and Prevention (CDC) estimates that "50% to 75% of sexually active men and women acquire HPV at some point in their lives."[15] Although Health Canada summarizes overall epidemiologic research about HPV and women by stating: "the prevalence of all types of HPV (cancer and non-cancer-causing) in different groups of Canadian women ranges from 20%−33%,"[16] a 2003 report in the *Canadian Medical Association Journal* revealed that about 1 in 4 participants aged 15 to 19 years in an HPV prevalence survey in Ontario were infected with carcinogenic HPV.[17] It has been reported that more than 35% of teens and young adults in various Western countries have acquired HPV, many having contracted this infection from their first sexual partner.[18-20]

Sexual debut at an early age and a lifestyle involving serial monogamy—a series of consecutive sexual relationships—places individuals at particular risk for contracting HPV. Transmission is facilitated by the following: there are high rates of communicability with at least a 50% chance of transmission in a single sexual encounter with an infected individual[21-23]; HPV is transmissible even in its early stages when it is frequently without symptoms; and few infected individuals are informed that although symptoms such as genital warts may respond to treatment, the underlying virus is generally untreatable and often remains transmissible. A study at 1 American university illustrates the pervasive nature of this STD among average Americans and highlights practical concerns: 60% of the sexually active female population were infected at some time during the 3-year period of the study.[24] A sexual relationship with a female on this campus thus presents an overwhelming risk of being in direct contact with this potentially oncogenic virus. It is important to note that depending on the host immune system function, a large proportion of HPV infections will resolve in the early stages,[17,25] suggesting that the incidence of primary infection may

be even higher than is indicated by the prevalence of ongoing infection and subsequent neoplasia. With the widespread prevalence of this infection, some researchers have concluded that HPV in the teenage population "should now be considered an inevitable consequence of sexual activity."[18]

High-risk HPVs are potent human carcinogens[26] and, according to information from the National Cancer Institute, they are associated with a variety of genital cancers in men and women.[27] The escalating incidence of cervical cancer, the second most common cause of cancer-related deaths among women worldwide,[25,28] is directly linked to increasing rates of persistent infection with carcinogenic HPV; whereas 5 HPV subtypes are responsible for most cancers, about 30 different subtypes have been associated with cervical carcinoma.[29] High-risk HPVs have also been implicated with other serious cancers, including cancer of the penis and anal area in men, and head and neck tumors, including some forms of oral, respiratory, and esophageal cancers.[16,30-39] Given the many potential sequelae of this infection, the development of an effective multivalent vaccine containing the majority of high-risk HPV subtypes would contribute significantly to the reduction of associated morbidity and mortality worldwide.[40] Although there are currently more than twenty different vaccines against specific HPV types being studied, vaccine development is still in the early stages.[26,41,42] The increasing prevalence of HPV, its high level of transmissibility, and the association of high-risk HPVs with various premalignant and malignant lesions makes this STD a serious public health concern, not only from the perspective of personal suffering, but also from an economic perspective.

HSV

HSV is a widespread sexually transmitted pathogen and remains one of the most common STDs worldwide.[43,44] Although the incidence of this infection varies from country to country, an article in the *Journal of the American Medical Association* reports that in the United States more than 20% of the adult population is infected.[43] This represents an increase of at least 30% in the last 25 years.[45] The incidence of HSV is escalating in other countries as well: in Sweden, a nation frequently cited as being progressive in the area of sexuality education,[46] the prevalence of this STD among pregnant women has risen from 19% to 33% over the last 2 decades[43]; and HSV-2 is widespread in some parts of eastern and southern Africa "with seroprevalence rising to 70% to 80% by age 30 years."[47] Although the symptoms experienced by afflicted individuals can be personally devastating—many have recurrent pain, ulceration, and a sense of personal stigma—this virus has other concerning implications. HSV increases the risk of acquiring other STDs, including HIV,[48] and it appears to be a cofactor that augments the risk of developing cervical cancer.[49] In addition to the serious and documented risk posed by mother-child transmission of this virus, recent evidence confirms that many individuals with asymptomatic or unrecognized infection are unknowingly transmitting the virus to sexual partners and offspring.[43,50] Vaccine prospects are still at a very preliminary stage and initial findings suggest that some vaccines in early testing are not effective for men or for those women who are seropositive for HSV-1 and seronegative for HSV-2.[51]

Chlamydia

One of the major causes of tubal infertility, ectopic pregnancy, pelvic inflammatory disease, and chronic pelvic pain is the pathogen, *Chlamydia trachomatis*. This is the most common bacterial STD in North America and Europe[52,53] and a prevalent STD in many areas of the developing world.[54] This infection is also a cause of urethritis, cervicitis, epididymitis, proctitis, and reactive arthritis and has recently been found to be a risk factor for the development of cervical cancer.[55] Despite that *Chlamydia* can be treated and eradicated, infection is frequently asymptomatic in the early stages; as a result, irreparable damage to adnexal structures frequently occurs before diagnosis and many people unknowingly transmit this organism to sexual partners.[56] It is estimated that 13% of American women are affected by this infection and about 300 million cases are reported on an annual basis worldwide.[57-59] The highest rates of *Chlamydia* are found in those between 15 and 24 years[58] and, although infertility may not be of primary concern during the teen and young adult years, the need for expensive, emotionally draining, and sometimes controversial assisted reproductive interventions later in life is a noteworthy, long-term concern. For those who do become pregnant, untreated *Chlamydia* during pregnancy may result in complications such as spontaneous abortion, premature rupture of membranes, premature delivery, low birth weight, and neonatal infections, including conjunctivitis and pneumonia.[52] Although the personal and medical challenges of this bacterial infection cannot be minimized, it is important to note that the economic burden of managing *Chlamydia* is also significant: in the United States the cost of managing this infection and its recognized complications was approximately 2 billion dollars in 1994.[60]

Special concerns related to STDs

In addition to the many challenges directly related to individual STDs, there are emerging concerns that relate to the impact of sexually acquired infections over the life

span of the affected individual and the potential sequelae of these infections for offspring.

Long-term sequelae of STDs

Although some STDs cause symptoms in the short-term, many sexually transmitted infections become manifest over a longer period and present as a variety of medical problems.[61,62] Maladies such as vaginal discharge, dyspareunia, cervical intraepithelial neoplasia, pelvic inflammatory disease, tubal infertility, ectopic pregnancy, and genital sores, may be common reasons for seeking medical care; however, many people do not realize that these concerns are frequently the direct result of previously acquired STDs. The correlation of various sexually transmitted infections, including HPV, hepatitis B, and *Chlamydia*, with certain cancers that develop some time after initial STD infection,[55,63,64] has become a particular concern. This emerging link between STDs and a variety of cancers clearly suggests that risky sexual behavior, including early sexual debut, must be considered a significant risk factor, not only for more familiar symptoms such as infertility, but also for the development of cancer over the life span.[16,32-37,55,65-67]

Although research most commonly focuses on the physical consequences of STDs, the psychosexual and psychosocial sequelae of contracting an STD, although difficult to quantitatively measure, should not be underestimated. While infected individuals may experience increased feelings of anger, depression, isolation, rejection, and guilt,[68-74] research also indicates that STDs may have a long-term negative effect on sexual enjoyment and that infected patients may experience the following: ''partial or complete cessation of sexual activity,'' ''a total or partial loss of interest in sex,'' a ''more inhibited and less spontaneous'' sex life, or ''anxiety related to sexual desirability.''[68] A recent conference paper exploring the psychosexual impact of HPV reported that this diagnosis ''can be expected to have repercussions in different spheres of the infected person's life, such as physical and sexual health, and social and interpersonal relations.''[75] With therapeutic encounters between busy physicians and patients frequently limited to the treatment of physical symptoms, it is critical that the long-term psychosexual and psychosocial sequelae of STDs be considered in discussions related to medical management of STDs.

Vertical transmission

There is increasing evidence in the medical literature that vertical transmission of various pathogens via intrauterine or perinatal spread is occurring on a wider scale than was previously recognized.[57] Most physicians understand that the upsurge in adult cases of syphilis in certain high-risk populations has led to a corresponding increase of congenital syphilis,[76,77] that mother-child transmission of HIV is increasing child morbidity and mortality in many developing nations,[5,78-80] and that the potential of HSV to cause death or serious neurologic consequences in newborn infants necessitates careful obstetric management of HSV-infected women.[50,81] The potential implications of vertically transmitted STDs are, however, continuing to emerge in the medical literature.

There is now substantial evidence for the vertical transmission of high-risk HPVs.[28,82-84] In 1999, for example, *Reviews in Medical Virology* reported that although the consequences of infection are uncertain, ''high-risk HPVs are present in at least 20% of healthy children.''[28] Despite evidence that surgical delivery by cesarean section may decrease vertical transmission, the possibility of transplacental transmission before delivery has become a concern.[84-86] Although documented reports of sequelae resulting from vertically transmitted HPV are uncommon in the literature, HPV has recently been implicated in retinoblastoma, a common childhood cancer.[39,63,87] Another research study, which explored maternal infections and subsequent psychosis among adult offspring, found a troubling correlation between maternal herpes infection (HSV-2) and certain types of psychotic disorders, including schizophrenia, in offspring.[88] Although the consequences of STDs in the lives of individuals can be serious and debilitating on a physical and social level, increasing concern about vertical transmission brings new intensity to the question of how to address the prevention and medical management of STDs.

Reevaluating STD management

Despite the many attempts over the last number of years to impact the enormous prevalence of STDs, rising infection rates suggest that objectives are not being met and that reassessment of prevention strategies should be a priority. Given the serious long-term health problems that STDs present to individuals over their life span, it is critical that current strategies are reevaluated and that underlying lifestyles and behaviors be addressed in an attempt to manage STDs through the primary prevention of problem behaviors. The World Health Organization estimates that two thirds of the sexually transmitted infections worldwide occur in teenagers and young adults; it is therefore essential that this population is specifically targeted as physicians and educators seek to address the STD epidemic.[89]

Risk reduction strategy

With the increasing recognition that risky sexual activity places adolescents at significant risk for a variety of sexually transmitted infections and their sequelae, physicians,

educators, and governing bodies have sought to impact escalating rates of disease by promoting various strategies aimed at reducing risk. These strategies have, for the most part, focused on preventing the spread of disease through the use of barrier protection in the form of the condom. Two major reasons account for the limited success of this approach and the persistently high STD rates despite extensive "safe sex" and "safer sex" campaigns throughout much of the world.

First, condom barrier protection provides little protection from the "SS" ("skin-to-skin" and "skin-to-sore") transmission of STDs such as HPV, HSV, syphilis, lymphogranuloma venerum (LGV), or chancroid.[57,90,91] Although condoms prevent contact between the skin of the penis and the mucosa inside the vagina and appear to offer some protection in women when viral lesions are confined to this area,[92] intercourse generally involves skin-to-skin contact in external genital areas; therefore, the protection offered by the condom against SS pathogens often found throughout the external genital tract is limited. It should also be noted that risk-reduction strategies aimed at encouraging nonintercourse sexual activity through "outercourse" and oral sex leave participants at risk for these types of infections.[93] HPV and HSV, for example, can be transmitted by oral as well as genital sex.[94,95] Because HPV and HSV, 2 infections that transmit through SS contact, are the 2 most common STD pathogens in many countries, the condom clearly provides inadequate protection against the spectrum of STDs.

Second, although condoms offer some protection against discharge-related infections such as HIV, *Chlamydia*, and gonorrhea,[57] protection may be compromised by compliance issues, incorrect use, or mechanical failure.[90,96-98] Extensive research demonstrates that average people, particularly youth, do not use condoms consistently in the long-term, regardless of knowledge or education.[92,96,99-109] Even among stable, adult, HIV-discordant couples who received extensive ongoing counseling regarding HIV risk and safer-sexual practices, only 43.3% used condoms consistently.[99] Widespread evidence confirms "irregular use of condoms provides no protection against transmission of HIV and STD."[110]

Reports of decreased rates of new sexually acquired infections as a result of advertising campaigns and increased condom usage by commercial sex workers (CSW) and their clientele[111-114] are reinforcing the focus on condoms as the primary preventative strategy for STDs. Careful analysis of the data, however, suggests that partner reduction played an important role in STD decline. After the "100% Condom Program" in Thailand, for example, which sought to encourage CSWs to use condoms 100% of the time, there was a precipitous decline not only in discharge-related STDs, but also in SS diseases such as syphilis, chancroid, and LGV.[111,112] These SS infections are commonly not within the scope of protection of regular condoms and frequently transmit despite condom use. In addition, the data reveal that mass advertising campaigns and widespread HIV education in various nations, including Thailand, Cambodia, Ethiopia, and the Dominican Republic, was associated with a sharp decline in reported casual sex and relations between female sex workers and male clientele.[113,115-117] Furthermore, according to research published in 1999 in the *Journal of Acquired Immune Deficiency Syndromes*, those who commenced the sex trade after the implementation of the mandatory condom program had higher rates of HIV than CSWs who initiated work prior to the program.[117] These combined findings suggest that abstinence from coitus with sex workers and partner reduction contributed significantly to decreased STD rates after advertising campaigns in these nations.[113,115,117,118]

In addition, the sexual behavior of CSWs cannot be legitimately extrapolated to other populations. Increased condom use in select groups of sex workers and their clientele in response to HIV education campaigns is not necessarily predictive of the behavior of ordinary adolescents. The practical reality is that individuals, especially young people, are less able to make consistent, safer health choices when they are sexually aroused. Like people throughout the world, recent evidence confirms that most ordinary Thai citizens, particularly adolescents, are not consistently using condoms, despite extensive educational programs.[119-121]

Although there is little doubt that proper, consistent, use of barrier protection will reduce the risk of discharge-related STDs, the lack of protection of the condom against the spectrum of STDs and the unsuccessful attempts to achieve sustained compliance in the general population restricts the impact of most current risk-reduction strategies. To meet the challenge presented by escalating rates of serious STDs, risk reduction must address the primary behavior that predisposes individuals to sexually acquired infections.

Addressing underlying risky behaviors

Condoms provide only limited protection against SS STDs and there is currently no cure for viral STDs, such as HPV, genital herpes, and HIV/AIDS. These facts, coupled with the serious life-long implications of many STDs, compel the medical profession to face 2 contrasting options when considering the optimal health and well-being of young people. Practitioners must either accept the high and worsening rates of STDs as inevitable and unavoidable; alternatively, they must consider an approach that focuses on addressing the underlying behaviors that predispose young people to acquiring STDs. Increasing evidence appears to support the adoption of a health-oriented approach that addresses sexual attitudes and behaviors by both educating about STDs and consistently recommending delayed sexual debut and partner reduction.[90,122-126]

The earlier a person experiences sexual debut, the more lifetime sexual partners they are likely to have and consequently, the higher their risk of contracting an STD.[127-130] Because the sexual lifestyle of young people frequently involves the early onset of sexual activity and subsequent serial monogamy, it must be recognized that the sexual lifestyle of numerous teenagers is, from a health perspective, inherently risky. Although the danger of acquiring a sexually transmitted infection increases with each additional sexual partner, it has also been documented that many individuals contact an STD as a result of their first sexual experience.[18] Recognizing that, from a STD perspective, sexual encounters include not only present partners, but also past partners and all of their partner's partners,[131] primary prevention through behavioral intervention is of key importance to long-term health.

It is fundamentally important to recognize that not unlike other adolescent high-risk behaviors, teen sexual activity is often an "expression of nonsexual need"[132] and is frequently a concomitant behavior associated with other basic problems or difficulties.[124,131-148] Although some practitioners may believe that modifying the sexual behavior of young people is unrealistic, it should be pointed out that "every successful form of prevention requires change in behavior."[149] Research confirms that some proactive interventions are able to affect attitudes regarding sexuality and, in many cases, appreciably diminish the likelihood of early sexual debut.[115,124,127,137,144,145,150-156] By addressing etiologic factors, primary prevention and sustained behavioral change can be achieved. In fact, research from CDC recently indicated that the level of sexual activity in the adolescent population is declining[157,158] and other recent studies indicate that the majority of sampled 13- to 17-year-old adolescents in America had not commenced sexual involvement.[159] The importance of addressing the primary sexual behavior of adolescents is highlighted by CDC: one of the national health objectives for 2010 developed by the US Department of Health and Human Services is "to increase…the proportion of adolescents in grades 9-12 who have never had sexual intercourse."[157]

The potential benefit of increasing the proportion of adolescents who have not had intercourse and promoting partner reduction is not limited to western nations. A publication by the US Agency for International Development (USAID) gives evidence for changes in sexual behavior and STD rates that have occurred in association with a "social vaccine" program[160] that was implemented nationally in Uganda. This program included widespread, intensive public health education, which addressed myths and misinformation, a primary focus on advocating delayed sexual debut and partner reduction, and risk reduction through condom use for HIV discordant couples and those having multiple sexual partners.[115,160] Reported changes occurring in association with this national program include the number of women reporting multiple sexual partners fell from approximately 20% in 1989 to 2.5% in 2000[161]; in one district, the rates of 13- to 16-year-old adolescents involved in sexual activity declined from nearly 60% in 1994 to less than 5% by 2001[160]; and, during approximately the same period of time, national HIV prevalence steadily declined from about 30% in 1992,[162,162] to an estimated 5% in 2001.[160]

Many authors have concluded that sexual behavior modification provides the most consistent explanation for the HIV decline in Uganda[160,163-168]; more specifically, the evidence suggests that "behavior change, as distinct from condom adoption"[116] has been the primary factor responsible for the marked reduction.[115,116,160] Condom promotion was not a dominant program element in Uganda:[160,169] ever-use of condoms remained low with only 16% of women in 2000 reporting that they had ever had sex involving condoms,[160] and a study of the general population in one district of Uganda found that only 4.4% reported consistent condom use.[110] In addition, Dr Vinand Nantulya, an Ugandan infectious disease specialist and government adviser who has been involved in a Harvard School of Public Health study of the Uganda experience, recently commented on the general attitude toward condoms in his country by stating, "Ugandans never really took to condoms."[161] Although condom use with nonregular partners has increased in Uganda in the past half decade, the primary behavioral modification in that country was summarized by the authors of the USAID report who concluded that in association with the concerted public initiatives to modify lifestyle, Ugandan men "were less likely to have ever had sex (in the 15- to 19-year-old range), more likely to be married, …and less likely to have multiple partners."[160]

The situation in Uganda contrasts starkly with other African nations such as Zimbabwe and Botswana. In these countries there were extensive initiatives promoting condom use and, compared with Uganda, there were higher rates of both condom sales and reported use; nonetheless, HIV prevalence in these countries is among the highest in the world.[6,160,161,170] There is an unprecedented 55.6% HIV prevalence among pregnant women aged 25 to 29 years in urban Botswana and current infection rates in Zimbabwe suggest that by 2020 there will be a 30% loss to the workforce because of AIDS.[170,171]

Comment

Given the current STD pandemic, it is imperative that physicians begin to reevaluate STD prevention and management strategies. Escalating worldwide rates of these infections, their potentially devastating short- and

long-term sequelae for infected individuals, and the economic and social impacts of these infections make STD prevention a critical issue. Although risk-reduction strategies and treatment of existing infection are important, the stark ineluctable reality is that to promote optimal, life-long health, primary prevention of infection must be promoted. The success of prevention programs that address primary sexual behavior suggests that serious deliberation of strategies promoting delayed sexual debut and partner reduction is warranted.

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