Guest Editorial

Rationalizing infection control in the dental office

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The last decade may be considered as a renaissance period for infection control in the dental office. Although acquired immunodeficiency syndrome (AIDS) may be the genesis of this revival, it is being sustained by current concerns regarding hepatitis C, tuberculosis, and biofilms in dental unit water lines. As a consequence, dentally related infection control has expanded from traditional handwashing and sterilization of surgical instruments into a complex network of guidelines, rules, and mandatory procedures, compounded by an ever-expanding array of adjunctive commercial products. If current infection control practices are not subjected to a critical evaluation, a potential exists for escalating regulations and costs to severely impede the provision of dental care.

The purpose of this Guest Editorial is to introduce a reasoned approach to the practice of infection control in the dental office.

Historical review

Today's approach to the prevention of disease transmission is based on concerns relating to AIDS. In the mid-1980s, fear that AIDS might be transmitted occupationally forced most regulatory and authoritative agencies to recommend the adoption of universal precautions. The prime purpose of these precautions was to protect the health care worker from the patient. However, the rationalization of infectious disease prevention must recognize that, traditionally, its major goal has been to protect and maintain the health of the patient. Although universal precautions might have been deemed appropriate 10 years ago, the relevance of this decision will be analyzed as part of this reasoned approach.

The first cases of AIDS were recognized in 1980 and 1981. It is commonly believed that AIDS is caused by human immunodeficiency virus (HIV) and that approximately 10 years must pass from the time of initial infection with HIV to the appearance of AIDS. If this is true, the patients diagnosed with AIDS in the early 1980s were infected with HIV in the early 1970s. Therefore, experience with AIDS and HIV extends over a 25-year period, which permits predictions about the syndrome to be made with a reasonable degree of confidence. During the period 1970 to 1987, the overwhelming majority of clinical dental staff did not use specific precautions designed to prevent the transmission of HIV during professional procedures. At present, there is no acceptable documented evidence that any dental health care worker has been infected with HIV as a consequence of a practice-related exposure.

The case of the Florida dentist with AIDS who allegedly transmitted HIV to patients continues to be the only example of such transmission from a dental practitioner to patients. Because the route of spread, if it did occur, remains unknown, it is impossible to suggest what precautions would most effectively prevent a recurrence of a similar dental AIDS mystery.

Integral to the adoption of universal precautions was the use of personal protective equipment by clinical staff. An assumption was made that the physical barriers provided by gloves, gowns, and masks would prevent the transmission of HIV from patients to staff. However, in the mid-1980s, there was no experimental, clinical, or epidemiologic evidence to substantiate this belief. From a historical perspective, the preuniversal precautions era was not accompanied by a substantiated occupational acquisition of HIV infection and AIDS by dental health care workers. The same conclusion applies to the present-day use of universal precautions. Therefore, it may be stated, with some confidence, that there is an infinitesimal risk of HIV transmission during dental treatment and that the cost effectiveness of requiring universal precautions to reduce this risk further should be analyzed, especially in light of increasing health care costs.

Although regulatory agencies now agree that the risk of HIV and AIDS transmissions in dental practice were exaggerated, universal precautions continue to be supported. The reasons given are concerns relating to hepatitis B, hepatitis C, tuberculosis, and biofilms. This excuse is interesting for two reasons. The first is that universal precautions were introduced not for these conditions, but to prevent transmission of HIV and AIDS. The second reason is that none of these conditions should be considered new. Although the potential for hepatitis B transmission in dentistry has been known since the mid-1960s, approximately 20 years had to pass before it became the secondary reason, after HIV, to alter traditional approaches to dental infection control. Today, rather than gloves, gowns, and masks, the hepatitis B vaccine is the most effective method of preventing the spread of the infection

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within the dental environment. Although the name *hepatitis C* is somewhat new because of the relatively recent identification of the hepatitis C virus, the disease itself is not, having been classified previously within the non-A, non-B, group of liver infections. There is no evidence that, apart from hepatitis B, dental patients or staff have been at greater risk than the general public for hepatic infections. Hepatitis C should be considered from this reassuring perspective.

For centuries, tuberculosis has been a major scourge of mankind, and it continues to be a common cause of morbidity and mortality, especially in developing countries. It is a reasonable assumption that, during the first half of this century, the tubercle bacillus was a relatively common pathogen of dental patients. Although minimal, if any, precautions were taken to prevent its transmission, there is no historical or epidemiologic evidence that tuberculosis was a significant infectious disease of dental practice. This perspective should be considered before the present risk of tuberculosis spread in dental offices is analyzed; and certainly before specific programs are devised to prevent its transmission.

Finally, biofilms are not a new phenomenon. They have always existed as an inevitable consequence of the dental water unit system. Thus, any association between biofilms, dentistry, and disease would have been established previously, if the relationship were significant.

In the mid-1980s, infection control in the dental office experienced a revolution, the genesis of which was the perceived risk of HIV and AIDS transmission. Such concern caused certain procedures to be mandated to quell the fears of dental staff and, to a lesser degree, provide protection for patients. However, a 25-year experience with HIV and AIDS indicates that the risk of their transmission has been grossly exaggerated. In addition, there is no historical or epidemiologic evidence to support the claim that the hepatitis C virus, tubercle bacillus, and biofilms represent significant sources of transmissible diseases in dental practice.

Current cross-infection preventive policies have been based on premature and unrealistic assessments of the transmissibility of certain pathogens, especially HIV. Further, there is no demonstrable proof that the spread of these pathogens is influenced by any of the mandated precautions, especially the wearing of personal protective equipment. It does appear as if current infection control in the dental office is based on myths, perpetuated by unrealistic expectations. A rational approach to this dilemma begins by considering the significance of nosocomial infections.

Nosocomial infections

A nosocomial infection is one not present or incubating prior to admission to a hospital but generally occurring 72 hours after admission. The assumption is made that the nosocomial infection has been acquired during the hospital stay. Hospital-based patients usually are medically or surgically compromised. This, combined with the complexities of modern treatment and the patients' relatively lengthy exposure to the hospital environment, ensures that patients are potential candidates for nosocomial infections. As a consequence, the traditional role of hospital infection control has been to preserve and improve the health of patients by monitoring the rates of nosocomial infections; identifying why, when, and where those infections occur; and suggesting proven methods that will keep the rates at acceptable levels. Thus, infection control in hospitals is a practical discipline concerned with the reality rather than the probability of nosocomial infections.

Theoretically, a risk of dentally acquired nosocomial infections exists; practically, this is less likely than hospital-based opportunistic infections for the following reasons. Most dental patients are ambulatory and healthy; extensive invasive surgery is not performed on such patients; and exposure to the dental environment seldom extends beyond 1 to 2 hours at any one session. The potential for nosocomial infections to occur depends on the dose and frequency of exposure to pathogens, divided by the resistance of the host. Therefore, there is less opportunity for nosocomial infections to occur in dental practice than in the hospital environment. This fact appears to have been forgotten, as attested to by the current fashion of equating the dental treatment area with a hospital operating room or intensive care unit.

However, dentally acquired nosocomial infections do exist. A list would include: localized osteitis, or *dry socket,* bacterial endocarditis, herpes simplex, aphthous stomatitis, and hepatitis B.

Localized osteitis is the most common nosocomial infection of dental origin. Although its prevalence may be reduced by careful attention to surgical technique and aseptic conditions, the infectious component is based on oral commensals that assume opportunistic properties following the creation of the surgical site, which acts as a portal of entry.

Bacterial endocarditis is the most life-threatening nosocomial infection of dental origin. Its infectious agent is also based on oral commensals that become opportunistic as a consequence of dental treatment. Its prevention is guided by established antibiotic regimens.

Herpes simplex, presenting as recurrent herpes labialis, is not an uncommon side effect of dental treatment. Stimulation of the latent virus may be related to trauma of the lips or the psychologic stress of dental care. However, similar to the previous examples, the infectious agent is endogenous, and does not arise from an exogenous source, such as the dental staff, instruments, or operatory furniture. One example is reported of a dental hygienist transmitting the virus to patients from a herpetic whitlow infection. This does not substantiate that such a route of transmission is significant from an epidemiologic perspective. If it were, the most effective method of preventing transmission would be to remove the hygienist from clinical care until the digital lesion resolved.

Aphthous stomatitis is not considered a transmissible infection. Indeed, it is questionable if the organisms that have been recovered from the oral ulcers represent the primary cause or opportunistic pathogens. The popular opinion is that recurrent aphthous stomatitis represents a response to altered immunologic controls, modulated by

factors such as stress and trauma. Perhaps this condition should be considered as a nosocomial consequence of dental treatment.

Hepatitis B is the only infection that is most likely to have an exogenous source of infection. The incubation period for hepatitis B is 45 to 180 days, which far exceeds the 72 hours defining nosocomial infections. The long incubation period imposes difficulties in tracing the probable source of the infection. This might be why there are fewer than 300 retrospectively documented cases of nosocomial dentally acquired hepatitis B infections. On the other hand, this should be perceived as a remarkably favorable figure, considering the millions of dental procedures that have been performed without universal precautions. However, it must be emphasized that the most effective method of preventing hepatitis B transmission is vaccination of the clinical staff.

A review of the nosocomial infections of dental origin reveals that none of them is influenced by personal protective equipment, the decontamination of the dental operatory, or the sterilization of instruments other than those involved in surgical procedures. Presumably, the primary purpose of infection control in the dental office is similar to its goal in hospital, which is to protect and preserve the health of patients by controlling nosocomial infections. If this principle is true, then universal precautions and various ancillary commercial products have had no influence on the rate of nosocomial dental infections. This realization is vital to rationalizing infection control in dental practice.

Protection of health care workers

The stated purpose of universal precautions is to protect health care workers from HIV infection and AIDS. As noted previously, the traditional purpose of infection control has been to preserve the health of patients. Thus, a legacy that AIDS might have deeded to the discipline of infection control is a focus on the fears of the providers rather than on the illnesses of the sick. Nevertheless, rationalization of infection control does require that practical attention be given to the prevention of occupationally derived infections among health care workers. This may be accomplished by recognizing two characteristics of infectious diseases. The first concerns exposure to a pathogen and infection from the microorganism, while the second relates to the prevention of exposure in the health care industry.

Exposure versus transmission

A considerable amount of the literature and advertising concerning the transmissibility of infectious diseases emphasizes that a variety of microorganisms may be cultured from numerous surfaces and devices in the dental clinic, such as charts, light switches, handpieces, impressions, radiographs, and the operatory air. The implications from these observations are that the microbes should not be present at those locations, but, because they are, exposure to them will result in disease. It should be understood that there is nothing new, strange, or unusual about the location of such microbes. Humans live in a polymicrobial environment. For example, the human body is inhabited by endogenous, usually normal, microbial flora, while exogenous microbes populate the air, soil, water, and food. Therefore, microbial contamination of instruments, equipment, and clinic furniture is inevitable. The significant question is, "Does such contamination cause cross infection?" The answer requires a brief description of how infectious diseases occur and are transmitted. A few definitions will assist with the understanding of these processes:

- An *infectious disease* is one caused by a pathogenic microorganism. The etiologic agent may be a bacterium, virus, fungus, or animal parasite and may be transmitted from another host or arise from the host's indigenous microflora.
- A *pathogen* is any disease-producing microorganism. Traditionally, it was acceptable to divide microbes into pathogenic and nonpathogenic categories. However, it is now known that under suitable conditions, especially if the host's defense mechanisms are reduced, nonpathogenic organisms are capable of causing disease. Consequently, it may be more appropriate to state that the term *pathogen* implies that a microorganism can, at least under certain circumstances, produce disease.
- *Virulence* is the degree of pathogenicity of a microorganism, as indicated by the severity of the disease produced and the microbe's ability to invade the tissues of the host. It is common to consider pathogenicity and virulence as synonymous; ie, a microorganism is more or less pathogenic, or more or less virulent, under particular circumstances.

A complex series of reactions and relationships coexist in determining whether or not a particular microbe will produce an infectious disease in a new host. The general principles are illustrated by the formula:

$$\text{Infection} = \frac{\text{Virulence of microbe} \times \text{Dose of microbe}}{\text{Host resistance}}$$

Host resistance appears to be more relevant to the development of an infection than are the separate characteristics of the potential pathogen. In other words, the healthier the medical and dental staff, the less likely they are to acquire occupationally derived diseases. Certain features of human pathogens also contribute to increasing the resistance to infection among health care workers. For example, most pathogens require stringent temperature, moisture, and light conditions, plus nutrients and pH levels, to sustain their viability. In addition, most human pathogens are site specific; eg, microbes that are capable of acting as pathogens in the lungs, tend to be incapable of colonizing and invading the tissues of the gastrointestinal system. These characteristics mean that, once human pathogens are removed from their "fertile soils" within or on the body, the general environment provides a harsh climate that is not conducive to their survival or growth.

Therefore, before organisms contaminating dental instruments or clinic furniture have a potential to induce infection, they must be virulent; have a minimal infecting dose; be transported to the anatomic site at which they are normally pathogenic; and be introduced to a host with a low resistance

because of poor health or lack of specific immunity. These criteria are not accomplished readily, which is significant in preventing occupationally acquired infections among health care workers.

A practical illustration will demonstrate this concept among clinical dental staff. Intraoral radiographs and dental impressions, on removal from the mouth, are contaminated by the patient's oral microorganisms, some of which may be pathogens. Neither the radiographic film package nor the impression material are growth media for the microbes; thus their virulence and numbers decline rapidly. Further, any pathogens present are site specific to the oral cavity. Therefore, the pathogens on the radiographic film package and impressions are incapable of causing disease, unless they are introduced, with sufficient virulence and numbers, into the oral cavity of a susceptible dental care worker. This is an unlikely event, but, interestingly, not one that would be prevented by the wearing of latex gloves.

Health care workers should understand that exposure to a pathogen is not synonymous with infection by the pathogen. Moreover, traditional behavior, such as handwashing and environmental cleanliness, reduces the virulence and volume of potential pathogens, while a healthy lifestyle and appropriate vaccinations maintain the resistance of medical and dental staff.

Prevention of exposures

The health care industry is concerned with sick people, whose illnesses might be of an infectious nature. The infection may be confined to a few patients or pandemic. It may be new to a community or a recurrence of a pathogen considered to be dormant or, at least, under control. A recent example of the latter is the resurgence of tuberculosis in the United States. An infection may be incubating in a patient who is undergoing treatment for an unrelated illness. A pathogen may become resistant to therapeutic drugs and become a serious hazard to other patients and staff. Methicillin-resistant streptococcus is an example of such a phenomenon.

Some staff members may believe that they are safe from such occupational exposures while cocooned within their personal protective equipment; however, gloves puncture, masks slip, and gowns tear. The reality of the situation is such that it is both impracticable and impossible to protect health care workers from all occupational exposures to human pathogens. Hospital-based medical staff are at a greater risk of being in contact with pathogens from sick patients than are dental personnel, especially those working in private practice. Nevertheless, all health care workers, including dental staff, must accept that a risk does exist of acquiring an occupationally derived infection and that it is not possible to reduce this risk to zero. Medical and dental staff who are unable to accept that such a risk does exist and cannot be avoided must consider removing themselves from their present employment.

Fear of the unknown was the genesis for the adoption of universal precautions to protect health care workers from HIV infection and AIDS. However, as demonstrated in the historical review, there is no substantive evidence that, with or without these precautions, health care workers are at risk of occupationally acquiring either of these conditions. The traditional, and continuing, essential role of infection control has been to reduce nosocomial illnesses among sick people. Such infections among dental patients result when endogenous microbes assume the characteristics of opportunistic pathogens, properties that are not influenced by personal protective equipment, decontamination of the operatory, or sterilization of handpieces.

Although exposure to a pathogen does not imply definite infection by the pathogen, such occurrences are an occupational hazard for health care workers. Quantifying the magnitude of this risk is difficult; indeed the numerous confounding variables may produce meaningless results. However, dental personnel should seek solace in the knowledge that, in the pre-AIDS, preuniversal precautions era, clinical staff had no different experience of dying from infectious diseases than did the lay public. There is no evidence to suggest that this situation has changed during the last 15 years.

Dental practice is restricted to relatively minor invasive procedures, performed by normally fit clinicians, on usually healthy patients. Consequently, the restrictive nature of dental care controls the strict criteria governing the creation of transmissible infections. This understanding is essential to introducing practical, but rational, infection control in the dental office.

Personal protective equipment

Employers do have a responsibility to provide a safe working environment for their employees. Although this is desirable and often feasible in an industrial setting, it is not an obtainable goal in health care, if safety includes a zero risk of occupationally associated diseases. Nevertheless, for safety reasons, personal protective equipment was mandated for use by clinicians, on the assumption that it would prevent their occupational acquisition of HIV and AIDS. Accordingly, since the late 1980s, there has been a massive expenditure on gloves, masks, and gowns, paid for from practice profits, increased fees, or the public purse, during a period when the entire health care industry was experiencing fiscal restraints.

The discipline of infection control operates by identifying disease transmissions and introducing methods to reduce their recurrence. The irony is that personal protective equipment was introduced without any evidence that the occupational transmission of HIV infection and AIDS was a significant problem and without any proof that the preventative paraphernalia would have any effect on the transmissibility of HIV and AIDS. Therefore, it does appear as if the basic principles of infection control were ignored, in the rush to appease the fears of health care workers regarding their perceived risk of disease acquisition from patients.

The avoidance of cross infection depends on the introduction of controls based on their expected ability to prevent transmissions. Therefore, before it was mandated that gloves, masks, and gowns be worn, it should have been determined which gloves, masks, and gowns actually prevent the transmission of HIV and AIDS. These

investigations have not been performed. At present, there are numerous studies on which gloves have few holes, but none on which gloves best reduce HIV transmission, which is the stated reason for mandating their use. Similarly, studies have been performed on the filtration capacities of various masks, but none has identified the one that best reduces HIV transmission.

The historical review indicates that HIV and AIDS are infinitesimal occupational hazards of health care workers and that the risk is not reduced further by wearing personal protective equipment. Some regulatory agencies and clinical dental staff might defend the use of gloves, masks, and gowns because they prevent direct contact with blood and saliva; reduce facial splatter by aerosolized blood, saliva, and other oral debris; attentuate the odors of halitosis; and provide physical and psychological barriers to the intimate nature of dental treatment. These offending conditions are not new. Traditionally, they have been an inevitable aspect of dental practice and have not been associated with unique morbidity and mortality among dental practitioners.

Personal protective equipment has a minimal, if any, proven effect on the health of dental staff. Therefore, it must not be considered as an essential safety feature that must be provided by employers. However, despite their failings, gloves, masks, and gowns provide many clinical staff with a sense of security, well-being, and cleanliness. As such, the decision to purchase and wear them should be the responsibility of the user. Certainly, public institutions should not have to bear the financial burden incurred by the cost ineffectiveness of personal protective equipment.

It may be argued that these suggestions are impractical, because patients believe that their exposure to HIV and AIDS is prevented if dental staff remain invisible behind gloves, masks, and gowns. Although the introduction of universal precaution has been used to allay the fears of dental patients regarding HIV and AIDS, the stated purpose of the precautions was to protect the health of clinicians. In reality, it remains an untested hypothesis that universal precautions do reduce the risk that patients and staff will acquire HIV or AIDS during dental treatment. There is no evidence that gloves, masks, and gowns would protect patients from these pathologic conditions, if their transmission in dental practice were possible. As stated previously, personal protective equipment does improve the working conditions of staff who are offended by certain aspects of their occupation. Armed with such knowledge, would patients remain willing to pay for gloves, masks, and gowns through increased fees or taxes, or would they rather have those monies used to enhance their treatment options?

Handpiece sterilization

The primary consequence of AIDS on dental practice is the wearing of protective clothing, and the second is the sterilization of dental handpieces. Unfortunately, the mandating of the latter is another example of professional behavior being modified by fear, inadequate investigations, premature conclusions, and hasty decisions.

As stated previously, the major reason for infection control in the dental office is to monitor and reduce unacceptable rates of nosocomial infections. Infection control is a practical discipline, which responds to actual examples of cross infection. It should not operate on the basis of theoretical assumptions, which may result in dramatic measures to control a clinically nonexistent problem.

Apart from a few isolated cases in which water from a dental handpiece may have been associated with oral infections in medically compromised patients, there has been no historical or epidemiologic evidence to support a relationship between handpieces and nosocomial infections. Theoretical discussions and laboratory experiments may convince some of the infectious potency of the handpiece. However, in the practical world of infection control, the handpiece has not been incriminated as a vehicle for the clinical transmission of disease. If it had, infection control personnel should have examined the type of infection, determined how the handpiece was responsible for the transmission, offered a solution, and followed up to assess the outcome of the response. Certainly, such an approach has not been conducted with regard to the spread of HIV infection and AIDS via a dental handpiece. At present, because such a route of transmission is an untested hypothesis, any theoretical methods of prevention are of no clinical significance. Despite this conclusion, regulatory authorities have mandated that dental handpieces be sterilized to prevent the transmission of HIV and AIDS. This recommendation should be considered as invalid because there are no clinical reasons to incriminate the handpiece and no proof that, if the handpiece were guilty, this corrective measure would be effective.

The adequacy of the sterilization process is influenced by the mass of debris on the device being sterilized. This mass, or bioburden, may prevent heat penetration and interfere with the sterilization cycle, producing disinfection but not sterilization. To avoid this occurrence, and to reduce bioburdens to an acceptable level, the surfaces of devices should be visibly clean prior to sterilization. Therefore, to ensure sterilization of a handpiece, it should be dismantled into its component parts, the external and internal surfaces of each made clean, and the parts sterilized along with a biologic monitor and subsequently assembled in a sterile environment—assuming that the monitor is negative. Unless such a procedure is followed, there is no guarantee that the handpiece is sterile, although it has been subjected to the sterilization process.

At present, there is no evidence that subjecting the handpiece to the sterilization cycle has had any effect on the rate of nosocomial infections in the dental office. If patients and staff realize this, and understand that "sterilization" of the handpiece may not achieve the desired goal, the regulatory requirement for handpiece sterilization assumes a different perspective. It is a perspective that is essential to the rationalization process.

Rationalizing infection control

The renewed interest in cross-infection control in the dental office has been based on the understandable human fear of the unknown. However, it is now

time to accept that this fear has not been realized. It must be appreciated that risks of HIV and AIDS transmissions in dental practice are infinitesimal and that the rates of transmission are not influenced by recently introduced regulations and recommendations. The first concept in rationalization is to agree that HIV and AIDS are not nosocomial or occupationally acquired infections of dental practice and do not demand special precautions. If this idea is accepted, the rationalization process is simplified, because infection control reverts to dealing with definitively acquired dental nosocomial infections. With such an approach, hepatitis C, tuberculosis, biofilms, and handpieces may be considered only as theoretical hazards, until cause-and-effect investigations and clinical outcome studies prove otherwise. Therefore, an essential concept of the rationalization process is that the major purpose of infection control is the prevention or, if their prevention is not possible, the maintenance at acceptable rates of clinically established nosocomial infections.

Dental staff have an undeniable right to improve their working conditions. Some may believe that personal protective equipment accomplishes this goal by avoiding some of the objectionable aspects of dental treatment. This opinion must be respected, but so also should the concept that there is no obligation upon employers to provide such clothing, until there is a clearly established relationship between its use and the improved health of employees. If this concept forces dental staff to purchase gloves, masks, and gowns, they should understand that not all procedures carry the same risk of exposure to potential pathogens. For example, restorative procedures under rubber dam have an infinitesimal risk, as does the taking of radiographs and impressions, while a recall examination has a risk factor that is considerably less than that associated with the surgical removal of an impacted tooth. Therefore, another concept in the rationalization process is modifying the use of personal protective equipment to the procedure that is being performed. Finally, the rationalization process must recognize that controls should not be introduced until their anticipated effect has been of clinical benefit and has been shown to be economically realistic and free of side effects.

In summary, the reasoned approach to infection control depends on the following concepts:

1. The removal of HIV and AIDS as the reasons for infection control protocols
2. The emphasis that the control of nosocomial infections is the prime purpose of cross-infection prevention in dental practice
3. The appreciation that the risks of disease transmission in dental practice are related to the procedures being performed
4. The recognition that infection control procedures must be based on their ability to prevent disease transmissions
5. The understanding that the risk of acquiring occupationally derived infections cannot be reduced to zero

Practical infection control

With acceptance of the previous concepts, it is possible to develop rational, practical, and effective infection control techniques for the practice of dentistry. The process is simplified if two categories are recognized. The first is standard precautions, which should be practiced on all patients for all procedures. The second is treatment-driven precautions, which vary according to the clinical care being performed.

Standard precautions

1. *Vaccinations for clinical staff.* These increase staff resistance. Hepatitis B immunization of all clinical dental personnel is recommended.
2. *Handwashing before and after all intraoral procedures.* This is the simplest, most cost-effective infection control procedure. It requires 10 seconds of washing under slightly warm running water with a bland domestic soap.
3. *Wearing of short-sleeved, visibly clean shirts or blouses.* This simplifies handwashing and is esthetically pleasing.
4. *Careful handling of sharps.* Although an unlikely source of infection in the dental office, sharp instruments and devices may cause physical injuries.
5. *Visibly clean and tidy operatories.* Principally for esthetic reasons, soiled working surfaces and operatory furniture should be made visibly clean and tidy between patients with household detergents or water.
6. *Cleaning, disinfection, or sterilization of instruments according to use.* Instruments that invade sterile tissues or vascular vessels create portals of entry into the body. If the instruments are unsterilized, potential pathogens may be deposited at the site, and an opportunistic infection may occur. Such instruments are classified as *critical* and, after use, must be cleaned and either sterilized or discarded. Instruments that touch the oral mucous membranes, but are not invasive, are unlikely to transmit oral pathogens to other patients or staff. These instruments are considered *semicritical,* and should be cleaned and disinfected between patients. Finally, instruments or devices that touch skin, but not mucous membranes, are classified as *noncritical,* with a negligible ability to cause disease transmission. They need only be visibly cleaned between patients. The staff members in each dental practice should decide into which classification each instrument belongs and process it accordingly.

These simple, rational, practical, and cost-effective precautions will suffice for the majority of procedures on the majority of dental patients.

Procedure-driven precautions

There are specific instances when the health history of the patient demands that additional procedures be adopted. These are designed to control nosocomial infections and to protect the staff.

Prevention of nosocomial infections

1. Antibiotic prophylaxis for bacterial endocarditis should be prescribed as per current official recommendations.
2. Chlorhexidine mouthwash should be administered to patients, and surgical procedures should be performed as aseptically, traumatically, and as efficiently as possible, to reduce the rate of localized osteitis.
3. Dental staff should avoid clinical practice if they have acute respiratory

infection, acute bloodborne infection, or acute infection of the hands or fingers. Isolation of clinical staff from patients during acute infections is the best method of ensuring that such infections do not become nosocomial.

4. Personal protective equipment should be used when treating intensive care unit patients, oncology and bone marrow transplantation patients, severely immunosuppressed patients, which would include AIDS patients with terminal illness. In such instances the gowns, gloves, and masks might offer these patients, who have extremely low resistance, some protection from potential pathogens being harbored by the clinical staff.

Protection of staff

1. Staff members should develop an understanding of the nature of common infectious diseases and how they are transmitted.

2. Patients with undiagnosed acute illnesses, including infections of the oral mucosa, respiratory tract, and facial skin, should be provided only with emergency treatment. These patients will be ill and unlikely to seek prolonged dental treatment. Minimizing staff contact with such patients reduces the potential for disease transmission.

The procedure-driven precautions are devised to enhance host resistance or reduce contact time with infectious conditions. They are rational, simple, and respect the conditions by which infectious diseases are spread.

The standard and procedure-driven precautions are all that are required to maintain an acceptable level of infection control in the dental office. The sterilization of semicritical and noncritical items may be performed, as may the routine wearing of personal protective equipment. However, staff should be aware that, from an infection control perspective, such exercises are unnecessary and cost ineffective. There is no basis for comparing the dental operatory to the intensive care unit or cardiac transplantation operating room.

Conclusions

The fear of HIV infection and AIDS transmission has derailed a rational approach to infection control. At present, dental investigators and regulatory agencies are more concerned with potential pathogens and theoretical situations than with the simple control of known nosocomial infections. If the dental profession permits this behavior to continue, the number of recommendations and commercial products necessary to counter the ever-increasing hypothetical dangers will constrict clinical practice and render it economically nonviable.

The alternative is to accept that the nature of dental practice is such that it never has been, and may never be, a significant source of nosocomial infections. This should be reassuring information for the profession and its patients. Based on such an understanding, it is possible to develop rational, simple, and cost-effective infection control procedures. It is recommended that serious consideration be given to adopting the standard and procedure-driven precautions described. In turn, this will free infection control from its hypothetical, paranoid stranglehold, and redistribute limited financial resources to enhance clinical care and oral health.