

Chapter 1

Essentials of infection control

WHY DO WE NEED INFECTION CONTROL IN DENTISTRY?

Dentists and other members of the dental team are exposed to a wide variety of potentially infectious micro-organisms in their clinical working environment. The transmission of infectious agents from person to person or from inanimate objects within the clinical environment which results in infection is known as *cross-infection*.

The protocols and procedures involved in the prevention and control of infection in dentistry are directed to reduce the possibility or *risk* of cross-infection occurring in the dental clinic, thereby producing a safe environment for both patients and staff. In the UK, all employers have a legal obligation under the Health and Safety at Work Act 1974 to ensure that all their employees are appropriately trained and proficient in the procedures necessary for working safely. They are also required by the *Control of Substances Hazardous to Health (COSHH) Regulations 2002* to review every procedure carried out by their employees which involves contact with a substance hazardous to health, including pathogenic micro-organisms. Employers and their employees are also responsible in law to ensure that any person on the premises, including patients, contractors and visitors, is not placed at any *avoidable risk*, as far as is reasonably practicable.

Thus, management of the risks associated with cross-infection is important in dentistry. We do not deal in absolutes, but our infection control measures are directed towards reducing, to an acceptable level, the probability or possibility that an infection could be transmitted. This is usually measured against the background infection rate expected in the local population, i.e. the patient,

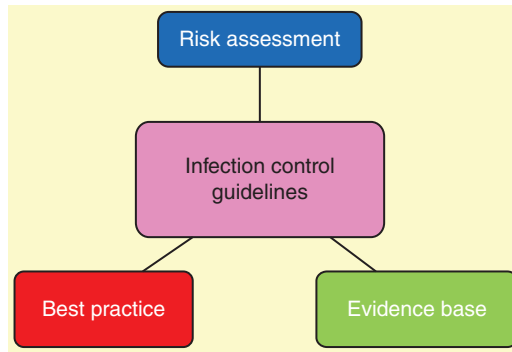


Figure 1.1 Factors influencing the development of infection control guidance in dentistry.

student or member of the dental team is placed at no increased risk of infection when entering the dental environment. Infection control guidance used in dentistry has developed from an assessment of the evidence base, consideration of the best clinical practice and risk assessment (Figure 1.1).

How we manage the prevention of cross-infection and control the risk of spread of infection in the dental clinic is the subject of this book.

RELATIVE RISK AND RISK PERCEPTION

Risk has many definitions, and the dental profession and general public's perception of risk can be widely divergent. This difference in interpretation can impact on how safe the general public perceives treatment in a dental clinic to be, especially following sensational media reports of so-called 'dirty dentists' who are accused of failing to sterilize instruments between patients or wash their hands! For example, risks under personal control, such as driving a car, are often perceived as more acceptable than the risks of travelling by airplane or train, where control is delegated to others. Thus, the public often mistakenly perceives travelling by car to be safer than by air, even though the accident statistics do not support this perception. Unseen risks such as those associated with infection, particularly if they are associated with frightening consequences such as AIDS or MRSA, are predictably most alarming to the profession and the public. Risks can be clinical, environmental, financial, economic or political, as well as those affecting public perception and reputation of the dentist or the team.

What makes risks significant? There are a number of criteria which make risks significant and worthy of concern.

- Potential for actual injury to patients or staff
- Significant occupational health and safety hazard

- The possibility of erosion of reputation or public confidence
- Potential for litigation
- Minor incidents which occur in clusters and may represent trends

Understanding what is implied by the term *hazard* is important when we consider the control of infection. This may be defined as a situation, or substance, including micro-organisms, with the potential to cause harm. Risk assessment must take into account not only the likelihood or probability that a particular hazard may affect the patient or dental staff, but also the severity of the consequences.

RISK ASSESSMENT AND THE MANAGEMENT DECISION-MAKING PROCESS

It is the role of managers of dental practices to manage risk. The Management of Health and Safety at Work Regulations 1999 require employers to carry out a risk assessment as an essential part of a risk management strategy. Infection control is an application of risk management to the dental clinical setting.

Risk management involves identification, assessment and analysis of risks and the implementation of risk control procedures designed to eliminate or reduce the risk.

Risk control in dentistry is dependent on a single-tier approach, in which all patients are treated without discrimination as though they were potentially infectious. The practical interpretation of this concept, known as Standard Infection Control Precautions (SICPs), treats all body fluids, with the exception of sweat, as a source of infection. SICPs are a series of measures and procedures designed to prevent exposure of staff or patients to infected body fluids and secretions. Specifically, dental healthcare workers (HCWs) employ personal barriers and safe behaviours to prevent the two-way exchange of blood, saliva and respiratory secretions between patient and operator (Box 1.1).

Decisions made within an organization, and within practice, should take into account the potential risks that could directly or indirectly affect a patient's care. If risks are properly assessed, the process can help all healthcare professionals and organizations to set their priorities and improve decision making to reach an optimal balance of risk, benefit and cost. If dental teams systematically identify, assess, learn from and manage all risks and incidents, they will be able to reduce potential and actual risks, and identify opportunities to improve healthcare.

Box 1.1 Summary of standard infection control precautions

- Use of hand hygiene
- Use of gloves
- Use of facial protection (surgical masks, visors or goggles)
- Use of disposable aprons/gowns
- Prevention and management of needlestick and sharps injuries and splash incidents
- Use of respiratory hygiene and cough etiquette
- Management of used surgical drapes and uniforms
- Ensure safe waste management
- Safe handling and decontamination of dental instruments and equipment

Risk assessment has the following benefits for delivery of dental healthcare.

- Strives for the optimal balance of risk by focusing on the reduction or mitigation of risk while supporting and fostering innovation, so that greatest returns can be achieved with acceptable results, costs and risks.
- Supports better decision making through a solid understanding of all risks and their likely impact.
- Enables dentists to plan for uncertainty, with well-considered contingency plans which cope with the impact of unexpected events and increase staff, patient and public confidence in the care that is delivered.
- Helps the dentist comply with published standards and guidelines.
- Highlights weakness and vulnerability in procedures, practices and policy changes.

HOW TO PERFORM A RISK ASSESSMENT IN A DENTAL PRACTICE

A risk assessment in dental practice involves the following steps.

1. Identify the hazards.
2. Decide who might be harmed, and how.
3. Evaluate the risks arising from the hazards and decide whether existing precautions are adequate or whether more needs to be done.
4. Record your findings, focusing on the controls.
5. Review your assessment periodically and revise it if necessary.

Stage 1: Identify the hazards

- Divide your work into manageable categories.
- Concentrate on significant hazards, which could result in serious harm or affect several people.

- Ask your employees for their views; involve the whole dental team.
- Separate activities into operational stages to ensure that there are no hidden hazards.
- Make use of manufacturers' datasheets to help you spot hazards and put risks in their true perspective.
- Review past accidents and ill health records.

Stage 2: Who might be harmed?

- Identify all members of staff at risk from the significant hazard.
- Do not forget people who only come into contact with the hazard infrequently, e.g. maintenance contractors, visitors, general public and people sharing your workplace.
- Highlight those persons particularly at risk who may be more vulnerable, e.g. trainees and students, pregnant women, immunocompromised patients or staff, people with disabilities, inexperienced or temporary workers and lone workers.

Stage 3: Evaluate the level of risk

- The aim is to eliminate or reduce all risks to a low level.
- For each significant hazard, determine whether the remaining risk, after all precautions have been taken, is high, medium or low.
- Concentrate on the greatest risks first.
- Examine how work is actually carried out and identify failures to follow procedures or practices.
- Need to comply with legal requirements and standards.
- The law says that you must do what is reasonably practical to keep your workplace safe.

A numerical evaluation of risk can be made to help prioritize the need for action and allow comparison of relative risk. *Risk* is equal to *hazard severity* multiplied by *likelihood of occurrence*. Assign a score of 1–5 for each, with a total value of 16–25 equating to *high risk*, 9–15 to *medium risk* and >8 to *low risk* (Figure 1.2).

Stage 4: Record your findings

Record the significant findings of your risk assessment and include significant hazards and important conclusions. Look at how current controls and protocols could be modified to reduce the risk further. Recording can be done simply on a spreadsheet or chart. The most important outcome of any risk assessment is the control measures so focus your efforts on making sure that the control measures the dental practice employs to manage the hazards associated with cross-infection and other aspects of health and safety are sensible and effective.

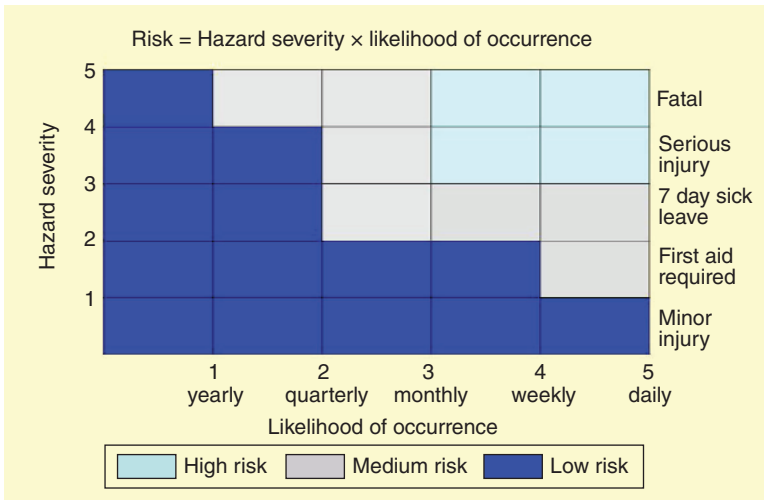


Figure 1.2 Grid showing how hazard severity and likelihood of occurrence are related to risk.

Information to be recorded includes the following points.

- Activities or work areas examined
- Hazards identified
- Persons exposed to the hazards
- Evaluation of risks and their prioritization
- Existing control measures and their effectiveness
- What additional precautions are needed and who is to take action and when

Stage 5: Review your assessment

Risk assessment is a continuing process and must be kept up to date to ensure that it takes into account new activities and hazards, changes in processes, methods of work and new employees.

You must document your findings but there is no need to show how you did your assessment, provided you can show that a proper check was made and you *asked who* might be affected, and that you dealt with all the obvious significant hazards, taking into account the *number of people* who could be involved, that the precautions taken are sensible and reasonable, and that the remaining risk is low.

HIERARCHY OF RISK MANAGEMENT CONTROL

Following a risk assessment, it is necessary to implement a plan to control the observed risk. The plan of action must set out in priority order what *additional controls are necessary*, and aim to reduce risks to an acceptable level and

comply with relevant legal requirements. You must also establish a reasonable time scale for completion and decide who is responsible for taking the necessary action.

There is a hierarchy of control options, which can be summarized as:

- elimination (buy in services/goods)
- substitution (use something less hazardous/risky)
- enclosure (enclose to eliminate/control risks)
- guarding/segregation (people/machines)
- safe systems of work (reduce system to an acceptable level)
- written procedures that are known and understood by those affected
- adequate supervision
- identification of training needs and implementation
- information/instruction (signs, handouts, policies)
- personal protective equipment (PPE).

These control measures can be applied as judged appropriate following the findings of the risk assessment, taking into account the legal requirements and standards, affordability and the views of the dental team.

INFECTION CONTROL AND THE LAW

Laws relating to infection control can arise from legal Acts and orders from the individual county or as European Union directives. A distinction must be made between Acts of Parliament, regulations and approved codes of practice and technical advice.

Regulations are laws, approved by the national legislative body. In the UK, the *Health and Safety at Work Act 1974* and in England the *Health and Social Care Act 2008 (Regulated Activities) Regulations 2014* are two primary legislative instruments that embrace all the major regulations, EU directives and technical guidance, for example COSHH, RIDDOR, HTM01-05 (decontamination in primary dental care), HTM07-01 (waste management), etc., that govern the way infection control and cleanliness are achieved in the dental surgery.

The Health and Safety at Work Act and general duties in the management regulations are goal setting and give employers the freedom to decide how to control risks which they identify. However, some risks are so great or the proper control measures so costly that it would not be appropriate to leave the discretion with the employer to decide what to do about regulating them. The Act and Regulations identify these risks and set out specific actions that must be taken. Often, these requirements are absolute – to do something without qualification by deciding whether it is reasonably practicable.

Approved codes of practice (ACOP) offer an interpretation of the Regulations with practical examples of good practice. ACOPs give advice on how to comply with the law by, for example, providing a guide to what is ‘reasonably practicable’. For example, if regulations use words like ‘suitable and sufficient’, an ACOP can illustrate what this requires in particular circumstances. So, if you follow the guidance in the ACOP you will be doing enough to comply with the law. ACOPs have a special *legal status*, which utilizes a reverse burden of proof. ‘If employers are prosecuted for a breach of health and safety law, and it is proved that they have not followed the relevant provisions of the ACOP, a court can find them at fault unless they show that they have complied with the law in some other way.’

LEGAL ACTS UNDER WHICH DENTAL PRACTICE IS CONDUCTED

Health and Social Care Act 2008 (Regulated Activities) Regulations 2014

The Health and Social Care Act (HSCA) laid down the framework for provision of new organizational structures and means of commissioning and providing NHS health services in England. The Care Quality Commission (CQC) came into effect on 1 April 2009 and was established by the HSCA to regulate the quality of health and social care. Registration and inspection of dental practices are managed separately in Wales, Scotland and Northern Ireland.

For primary care dental services in England, registration with the CQC as a provider or manager was required from 1 April 2011. It is illegal and therefore a criminal offence for any primary care dental service to carry out any regulated activities unless it is registered with the CQC. Once registered, providers are monitored by the CQC and must comply with any conditions of registration. CQC inspections report on whether the dental services provided are *safe, effective, caring, responsive* and *well led* in relation to a standard set of key lines of enquiry (KLOE), which include ‘cleanliness and infection control’. The CQC benchmark for assessing cleanliness and infection control is the HSCA-Approved Code of Practice 2015 which comprises 10 criteria for delivering infection control and prevention across healthcare, including dentistry.

Antimicrobial stewardship in dentistry

Criterion 3 of the HSCA-ACOP relates to antimicrobial stewardship and antimicrobial prescribing. Inclusion of this criterion alongside infection control measures reflects an expedient response to the dramatic rise in antimicrobial resistance worldwide over the last decade, coupled with stagnation in the

Box 1.2 Basic principles for antibiotic stewardship in dental practice

- Systems should be in place to manage and monitor the use of antimicrobials to ensure inappropriate use is minimized.
- Patients should be treated promptly with the correct antibiotic, at the correct dose and duration whilst minimising toxicity (e.g. allergic reactions) and minimising conditions for the selection of resistant bacterial strains.
- These systems should draw on published national and local guidelines, monitoring and audit tools, for example: BNF (DPF), NICE, Faculty of General Dental Practice UK guidance on antimicrobial prescribing for general dental practitioners (Open Standards).
- Providers should ensure that all dental prescribers receive induction and training in antibiotic use and stewardship.

Source: HSCA-ACOP criterion 3.

development of new classes of antibiotics to manage micro-organisms resistant to first-line treatments. In the UK, nearly 70% of dental prescribing of drugs is for antibiotics and research has shown that approximately 50% of dentists overuse antibiotics or are guilty of poor prescribing practices. Box 1.2 outlines the basic principles for setting up antimicrobial stewardship in dental practice.

Health and Safety at Work Act 1974

In the UK, the Health and Safety at Work Act (HSWA) requires a safe working environment and sets the precedent from which all other health and safety regulations follow. Employers have a duty under the law to ensure, 'so far as is reasonably practicable', the health, safety and welfare of their staff and members of the public at their place of work. The HSWA is periodically updated. The *Management of Health and Safety at Work Regulations (MHSWR) 1999* made more explicit what employers are required to do to manage health and safety. MHSWR place the legal responsibility for health and safety primarily with the employer. In particular, this Act required employers to look at the risks in their workplace and take sensible measures to tackle them, i.e. to carry out risk assessments as discussed above. It is the duty of the employer to *consult with staff* on matters which may impact on their health and safety at work, including:

- any change which may substantially affect their health and safety at work, e.g. in procedures, equipment or ways of working
- the employer's arrangements for getting competent people to help him/her satisfy health and safety laws

- the information you have to be given on the likely risks and dangers arising from your work, measures to reduce or get rid of these risks and what you should do if you have to deal with a risk or danger
- the planning of health and safety
- the health and safety consequences of introducing new technology.

The duties of employers under this law include:

- making the workplace safe and without risks to health
- ensuring plant and machinery are safe and that safe systems of work are set and followed
- ensuring articles and substances are moved, stored and used safely
- providing adequate welfare facilities
- giving the information, instruction, training and supervision necessary for the health and safety of staff and the public.

Control of Substances Hazardous to Health Regulations 2002

The law requires employers to control exposure to hazardous substances to prevent ill health. They have to protect both employees and others who may be exposed by complying with the COSHH regulations. COSHH is a useful tool of good management which sets basic measures, with a simple step-by-step approach, that employers, and sometimes employees, must take which will help to assess risks, implement any measures needed to control exposure and establish good working practices.

Note that hazardous substances include not only chemicals such as mercury, solvents and the materials used in dentistry, but also biological agents such as bacteria and other micro-organisms.

The Regulations require COSHH risk assessment to be made on all the materials used in dental practice.

Under the Regulations, where it is not reasonably practicable to prevent exposure to a substance hazardous to health via elimination or substitution, then the hazard must be adequately controlled by ‘applying protection measures appropriate to the activity and consistent with the risk assessment’. Where members of the dental team or students are treating individuals known or suspected to be infected with a micro-organism spread by the air-borne route, then protective measures would include adequate ventilation systems and the provision of suitable personal protective equipment (PPE). The legislation requires employers to provide PPE that affords adequate protection against the risks associated with the task being undertaken. Conversely, COSHH

requires that employees actually wear PPE provided by the employer, who should take all reasonable steps to make sure that PPE and any other appropriate control measures are instituted in the practice or dental hospital. The Regulations require risk assessment to be made on all the materials used in dental practice.

Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) 2013

Reporting accidents at work and occupational ill health is a legal requirement. RIDDOR puts duties on employers, the self-employed and people in control of work premises (the Responsible Person) to report to the Health and Safety Executive (HSE) certain serious workplace accidents, occupational diseases and specified dangerous occurrences (near misses). Incidents that happen in Northern Ireland should be reported to HSE NI. This information enables the HSE and local authorities to identify where and how risks arise and to investigate serious accidents. You must report:

- all deaths in the workplace
- specified injuries and over-seven-day incapacitation of a worker which results in the employee or self-employed person being away from work or unable to perform their normal work duties for more than seven consecutive days plus the day of the accident (includes weekends and rest days)
- diagnoses of certain occupational diseases, where these are likely to have been caused or made worse by their work including, for example, Legionnaires' disease, hepatitis B
- non-fatal accidents to non-workers (e.g. members of the public), if they result in an injury and the person is taken directly from the scene of the accident to hospital for treatment to that injury.

The report must be made within 15 days of the accident. Over-three-day incapacitations (but less than seven-day) from accidents in the workplace must be recorded in an accident book but do not need to be reported to the HSE. Thus, the dental surgery must be an environment where we positively encourage accident reporting and near misses by all the dental team.

Pressure Systems Safety Regulations 2000

If pressure equipment fails in use, it can seriously injure or kill people nearby and cause serious damage to property. Because autoclaves are pressurized vessels and are potentially explosive, they come under legal requirements to be tested annually to ensure safety and also for insurance purposes. The Pressure Systems Safety Regulations came into force in 2000 and cover the installation and use of steam sterilizers.

Following installation of the sterilizer and before it is used, the dental practice must obtain a written scheme of examination for each sterilizer from the manufacturer, supplier or insurer that has been prepared by a Competent Person (Pressure Vessels). A certificate is issued as proof of each inspection, and is retained in the sterilizer logbook. Users and owners of pressure systems are required to demonstrate that they know the safe operating limits, principally pressures and temperatures, of their pressure systems and that the systems are safe under those conditions.

As a legal requirement, each sterilizer must have:

- a written scheme of examination
- a periodic examination of the pressure system and retention of the certificate
- third party liability insurance that specifically covers risks associated with the operation of pressure vessels, e.g. sterilizers and compressors. Such risks may not be covered by the practice's building insurance
- a record of all repairs and maintenance of the pressure system.

PUBLISHED STANDARDS AND GUIDANCE

Standards and guidance relating to infection control and prevention are set and can be obtained from a number of government agencies and other public sources. The key agencies and organizations for the UK, and where applicable the country-specific equivalent government organizations and guidance for Northern Ireland, Scotland and Wales, can be found on the companion website (www.wiley.com/go/pankhurst/infection-prevention).

Policy

The arms of government, outlined above, dictate policy which is published in the form of strategic documents which they seek to implement. These policies are often the work of special advisory bodies such as the Advisory Committee on Dangerous Pathogens (ACDP) whose remit is to advise on all aspects of hazards and risks to workers and others from exposure to pathogens and risk assessment advice on transmissible spongiform encephalopathies (TSEs).

When the Department of Health agrees on a strategy, it cascades this down to those local organizations which are tasked with implementation such as local authorities and health boards. Health service circulars and letters from the Chief Dental Officer are used to communicate with people in the dental profession and these can be accessed on the websites for your local area.

Procedures

Guidance and recommendations on infection control procedures undertaken in dental practice are cascaded down to dental professionals via a variety of formats including, for example, health technical memoranda (HTM), health building notes, drug and device alerts, and drug safety updates. These provide the essential information we need if we are to keep up to date with what would be considered good practice. Drug and device alerts are often written in response to adverse incidents where there is a need to communicate changes in practice following from the experience gained when an incident has occurred with equipment or medication.

Health Technical Memoranda

These publications give technical advice and guidance on specific healthcare topics and set out recommendations for good practice. An example of an HTM is *HTM 01-05 Decontamination in Primary Care Dental Practices*, which has had a major impact on dental practice in the UK. This HTM provides in-depth guidance on all aspects of the decontamination cycle, which includes choice, specification, purchase, installation, validation, periodic testing, operation and maintenance of ultrasonic baths, thermal washer disinfectors and sterilizers. The practices and procedures described in HTM 05-01 and the country-specific equivalents are covered in Chapter 7.

Implementation

The implementation of policy and procedures has to be monitored at the local level and this has been incorporated into quality assurance and clinical governance. Clinical governance is a systematic approach to maintaining and improving the quality of patient care within a health system. Governance incorporates existing activities such as clinical audit, education and training, research and development, and risk management. For example, the results of the biannual decontamination audits required under HTM 01-05 act to maintain best practice where it exists, or highlight areas for improvement and generate action plans, steering the move towards best practice in decontamination.

TEAM APPROACH TO PREVENTION OF INFECTION

A team is more than just a group of people working together; it has been defined as:

A small number of people with complementary skills who are committed to a common purpose, performance goals and approach for which they hold themselves mutually accountable.

Infection control of necessity requires a team approach and each member of the team must have complementary skills and share the common purpose to ensure safe practice. 'For the team to function effectively there must be clear goals shared by the team, good communication between the team members, with clear, fair leadership and an open climate based on respect and absence of a blame culture.' This will encourage staff to feel confident and safe to treat patients with potentially infectious disease and to express their concerns on infection matters and thus contribute to the improvement of service delivery. Generally, teamwork improves job satisfaction, increases the sense of being valued and encourages a collective responsibility for the delivery of service.

Effective leadership is an important constituent of the dental team and leaders (dentists, registered managers or infection control leads) must provide a clear vision of the standard of excellence which the team is seeking to achieve and communicate this to other members of the team. This is best achieved by ensuring that there is adequate induction and ongoing training for all members of the dental team in infection control and that there are regular clinical management meetings within the practice. Meetings are required to allow communication between the team members and for risk assessments to be undertaken as new problems arise. There is evidence that busy dental practices often do not have regular structured team meetings built into their routine, but particularly in the rapidly developing field of infection control, these meetings are essential.

Communication is essential if the members of the dental team are to report accidents and feed back their opinions, reservations and fears regarding infection control policy and conditions of work in the dental practice. Individuals must not be discouraged by the perception of 'failure' if they report accidents or incidents.

It is useful to consider what the causes of human failure are, as human error is one of the most frequent reasons for breaches in infection control practice. Failure is usually caused by either:

- *errors in knowledge* where the HCW did not know what they were supposed to do to, for example, the importance of safe disposal of sharps and the prevention of transmission of infection by aerosol in the clinic, or
- *errors in skills* where the HCW did not have sufficient training to, for example, carry out procedures such as decontaminating an instrument or using a scalpel safely.

There may be a prevailing environment in the dental surgery which, due to poor organization and failure in management, is conducive to personal failure and errors. The reduction of human error is therefore closely related to good practice management and to having an effective team.

Human error can be minimized by improving job design. The employer should ensure that everyone knows his or her duties and has the skills to

accomplish the tasks. Prevent boredom and subsequent errors by introducing job rotation and job enrichment. Practices can introduce enhanced training and multiskilling of staff, which gives the HCW new challenges and a sense of ownership and maintains interest and pride in 'a job well done'.

Lastly, encouraging staff participation in decision making and making them feel a valued member of the dental healthcare team will reduce errors, and if errors do occur, they will be quickly corrected and be unlikely to reoccur.

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