INFECTION CONTROL

DESIGN AND PRACTICES IN DH DENTAL CLINICS

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INFECTION CONTROL

DENTAL CLINIC DESIGN MAJOR CONSIDERATIONS

• Operational work flow
• Occupational safety and Health
• Infection control
• Ergonomics
• Barrier Free Access
• Comfort
• Professional image
• Esthetic

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INFECTION CONTROL

BASIC PRINCIPLES

• Zoning clean and dirty zones, clinical area and support area
• Flows from clean to dirty
• Simple to decrease contact surfaces
• Seamless to avoid un-cleansable area
• Smooth to allow easy disinfection
• Durable material able to withstand repeated disinfection

BASIC PRINCIPLES

ZONING

• Clinical area: dental surgeries, sterilization room, x-ray room, recovery room...
• Supportive area: reception office, waiting area, server room, plant room, pantry, toilets...
• Use color for easy compliance, e.g. red for dirty and green for clean

ZONING

LAYOUT CONSIDERATION

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Building Services
- Heating, Ventilation and Air Conditioning
- Fire services
- Water supply and drainage
- Electrical supply
- Compressed air and suction system

Builder's work
- Ceilings
- Walls
- Floor
- Cabinets
- Doors

HUMIDITY, VENTILATION AND AIR CONDITIONING

Goal
- Temperature: 22°C for clinical area (25.5°C for general offices)
- Relative Humidity: 50-60%
- Air Change per Hour (ACH): 2-6
- Air flow: from clean to dirty area
- Air Pressure: +ve for clean room, -ve pressure for dirty room e.g. toilet

CHECKLIST

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ACH AND AIR FLOW
- 1 ACH will reduce the concentration of a given contaminant within a room by 67% in 1 hour, whereas a ventilation rate of 6 ACH will reduce the contaminant concentration by more than 99% in the same period.
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) recommends 6 ACH for dental department in hospital.
- The overall air movement of a dental clinic should flow from waiting area to the sterilization area and finally the toilets.
CHECKLIST

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WATER SUPPLY

- CDC recommends <500 CFU/ml (colony forming units of heterotrophic bacteria per milliliter of water)
- The quality of the water supplied by Water Supplies Department (WSD) conforms to the Guidelines for Drink-water Quality recommended by WHO

POTENTIAL CONTAMINATION

- Back-flow can occur
- Water is drawn from an appliance into the pipework supplying it
- Any contamination present in the appliance could find its way into water used for drinking or food production, with serious consequences for health

PUT INTO PRACTICE

- Potable water supply for domestic use
- Break tank (non-potable water) for clinical water supply for medical use, include dental unit, instrument sinks, autoclaves and film processor etc...
- Consult plumbing system designer

DRAINAGE

- Standard gravity drainage system should be provided in general
- Sump Pump system, with drain pipes running in the ceiling void for waste water in dental surgeries should be avoided to prevent undesirable consequences during the break down of the system
Drain pipe

All conduits and pipes concealed

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ELECTRICAL SUPPLY
- Emergency power supply may needed for normal functioning of autoclave
- 3 phase power supply for plant room and instant electric water heaters
- Dental clinics need 3 times electrical power supply

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COMPRESSED AIR AND VACUUM SYSTEMS

Quality requirement
- Health technical Memorandum (HTM 2022-supplement 1) DH, UK
  - "The compressor should be fitted with an air-intake filter and a post compression filtration and dry system, to ensure that the air is clean and dry, minimizing the risk of contamination of the system by micro-organisms…"
- Industrial compressor should not be used
VACUUM SYSTEMS

- **Dry system**: waste water drain away by a separator before the air enters the vacuum pump; the pipes remain dry.
- **Wet system**: waste water and air enter the vacuum pump, where they are separated; the pipes are wet.
- **Semi dry system**: similar to dry system, but the vacuum pump and separator are combined; the pipes are wet before enter the pump.

In dry systems, the vacuum line is relatively dry and clean compared with wet system, which helps minimize bacterial contamination of the vacuum line.

VACUUM EXHAUST FILTRATION

- The exhaust from the vacuum system should be sited outside, away from air intakes, opening windows etc. (preferably above roof level) and be clearly labeled.
- A bacterial filter (HEPA filter) should be inserted in the system, preferably between pipework and vacuum pumps.

Builder’s work

CEILING

- Aluminum false ceiling with acoustic features to reduce the growth of fungus.
- Arrange the “air return” near the entrance to avoid dropping of dust over the clean area.

CHECKLIST

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WALLS
- Cleansable, smooth and anti-fungal
- Non VOC emulsion paint, vinyl sheet, compact board, or ceramic tiles
- Avoid too much texture

FLOOR COVERINGS
- Vinyl flooring sheet with self-coving skirting (No need for separate skirting)
- Wax free and high coefficient of resistance
- All joins sealed
- Avoid carpet and wooden flooring

Seamless floor
Self-coving
CABINET

- Design to facilitate routine disinfection
- Simple, smooth and seamless
- Able to withstand Alcohol and bleaching solution
- Avoid open shelf
- Solid surface countertop and laminated wood (include all the inside surfaces)
- Drawers should deep enough to enhance flexibility and placement of covered trays

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PROPRIETARY PRODUCTS

Drawers deep enough to accommodate covered trays
Internal surfaces laminated

Conceal equipment
HAND WASHING BASIN
- At least 1 in a dental surgery, not to share with instrument cleaning sink
- Medical grade hand free tap and dispenser preferred
- No overflow protection and plug needed

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DOORS
- Door knobs can serve as a fomite to indirectly transmit infectious organism
- Need regular disinfection

- Consider automatic doors with hand free sensor or foot control
Function Rooms

- Dental surgery
- Central sterilization room (instrument reprocessing area)
- X-ray room and film processing area
- Laboratory

DENTAL SURGERY
- Optimize size for ergonomics, OSH, and infection control
- Simplified cabinets to minimize contacts
- Zoning should be clearly delineated
- 1 meter space from the patient’s mouth to the bench top to avoid splatter contamination

[Diagram of dental surgery setup]
STERILIZATION ROOM

- CDC “…should process all instruments in a designated central processing area to more easily control quality and ensure safety. The central processing area should be divided into sections for:
  - 1) receiving, cleaning, and decontamination;
  - 2) preparation and packing;
  - 3) sterilization; and
  - 4) storage.

BEST PRACTICE STERILIZATION ROOM

PRACTICAL STERILIZATION ROOM LAYOUT