OVERVIEW

This standard focuses on the design and manufacture of implant-based prostheses; dental devices which are custom-made to fit the patient’s unique mouth shape and which replace one or more missing teeth. It is vital that the dental technician works as part of the team in the diagnostic and treatment planning phases as well as in the design and manufacture of the prosthesis itself. Due to the time over which implants need to settle in a patient’s mouth prior to the final prostheses being fixed, provisional prostheses are often provided.

The term client is used to mean the member of the oral health care team who has prescribed the custom-made prosthesis. Clients may be external to the organisation (such as general dental practitioners) or internal (eg within a dental hospital). The patient is the individual for whom the custom-made prosthesis is being made.

Users of this standard will need to ensure that practice reflects up to date information and policies.

Version No 1

KNOWLEDGE AND UNDERSTANDING

You will need to know and understand:

1. the skeletal anatomy and physiology of the head and neck
2. the structure, function, and movement of the oro-facial musculature (including the tongue) and temporomandibular joint
3. disorders and diseases affecting the oral cavity (eg angular cheilitis and denture trauma, denture stomatitis, denture induced hyperplasia, erosive lichen planus and chronic aphthous ulceration and dry mouth)
4. tooth morphology and the form of the natural anterior and posterior teeth
5. the aetiology and classifications of malocclusions
6. the physiological and pathological changes associated with the ageing process and trauma (eg the changes in enamel, dentine and pulp that occur with age and how these affect tooth shape and colour, the effect of tooth loss on the supportive dental tissue, the processes and effect of ridge resorption)
7. the importance of retention of the periodontal ligament and the changes in
| 8. | the broader factors (sociological, behavioural, environmental and economic) that contribute to oral health and illness |
| 9. | the emotional response by the patient to tooth loss |
| 10. | the role of implant-based prostheses in the restoration and maintenance of: |
| 1. | tissue support |
| 2. | aesthetics |
| 3. | phonetics |
| 4. | function of occlusion and the temporomandibular joint |
| 11. | the importance of restoring and maintaining the occlusal vertical dimension |
| 12. | the benefits and restrictions of implant-based prostheses |
| 13. | the use and need for transitional implant-based prostheses |
| 14. | retention and stability |
| 1. | the effect of skeletal form and ridge relationships upon the function, design and manufacture of implant-based prostheses |
| 2. | the effect of the residual ridge shape and contour on the retention and stability of implant-based prostheses |
| 3. | the effect of saliva viscosity on the retention of implant-based prostheses |
| 4. | the effect of the oro-facial musculature on the retention and stability of implant-based prostheses |
| 5. | the effects of the use of passive and displacive impression techniques on the retention and stability of implant-based prostheses |
| 6. | the principles and the clinical criteria for the use of the neutral zone impression technique |
| 7. | the importance of the use of biometric guides during the stages in the manufacture of implant-based prostheses |
| 8. | the role of the baseplate in the retention and stability of implant-based prostheses |
| 9. | the role of bucco-lingual positioning of artificial posterior teeth in the stability of implant-based prostheses |
| 10. | the role of the positioning of artificial anterior teeth on the stability of implant-based prostheses |
| 11. | the importance of artificial posterior tooth form and mould on the stability of implant-based prostheses |
| 12. | the role of the polished surfaces in the retention and stability of implant-based prostheses |
| 13. | the importance of occlusal rims in establishing tooth position in the manufacture of implant-based prostheses |
| 14. | the importance of establishing and maintaining the occlusal table on the stability of implant-based prostheses |
| 15. | the role of compensating curves in minimising instability of implant-based prostheses |
| 15. | aesthetics and phonetics |
| 1. | the importance of pre-extraction guides in the development of acceptable aesthetics in the manufacture of implant-based prostheses |
| 2. | the various methods of determining anterior tooth form for the manufacture of implant-based prostheses |
| 3. | the role of dentogenic concepts in the selection of artificial teeth for the manufacture of implant-based prostheses |
| 4. | the importance of developing patient confidence in the process of implant design and production |
| 5. | the effect of the ageing process on natural tooth form and colour |
6. the importance of posterior tooth form in the development of acceptable aesthetics for the manufacture of implant-based prostheses
7. the importance of tooth material selection on the maintenance of aesthetics of implant-based prostheses
8. aesthetic and phonetics considerations in the anteroposterior positioning of upper and lower artificial anterior teeth
9. anatomical complications of implant-based prostheses manufacture
10. the compromises sometimes necessary between aesthetics and function in the provision of implant-based prostheses
11. the role of anatomical contouring in improving the aesthetics of implant-based prostheses
12. the importance of base material selection on the appearance of implant-based prostheses
13. the effect of staining on the aesthetics of implant-based prostheses
14. the effect of racial variation in mucosal coloration on the aesthetic design of implant-based prostheses and materials selection
15. the challenges presented by overdenture abutments when maintaining acceptable appearance in implant-based prostheses manufacture
16. the importance of baseplate design in the development of good phonetics

16. articulation
1. the selection of a suitable dental articulator for the type of implant-based prosthesis
2. the benefits and restrictions of the various types of dental articulator
3. the various methods of transferring clinical information to the dental articulator
4. the use and need for kinematic relators (facebows, earbows and pantographs etc.)
5. the importance of hinge axis for the partially dentate mouth or where paranormal function of the temporomandibular joint exists
6. the purpose of split mounting and re-articulation procedures
7. the need to make adjustments to the various component parts of dental articulators based on the type and form of the patients existing or intended anterior tooth arrangement and occlusion
8. the purpose of centric and eccentric wafers when making adjustments to dental articulators
9. the indications and contraindications of using eccentric wafers in the development of occlusal stability during the manufacture of removable prostheses
10. use of custom table

17. the principles of implant-based prosthesis design
1. the classifications of partially dentate mouths
2. the classifications based on the nature of support gained by the implant-based prosthesis during the transmission of masticatory forces
3. the principles of cast surveying and its application to implant-based prosthesis design and manufacture
4. the different anatomical structures which are used in implant-based prostheses
5. the use of implants for single tooth replacements
6. the use of implants for anchorage in orthodontic tooth movement
7. the need to identify the component parts of implant-based prosthesis
8. the rationale for the selection of materials to fulfil the design requirements of implant-based prostheses
9. the factors influencing the design, peripheral outline and basic contours of the
10. the principles of direct retention when applied to implant-based prosthesis design
11. the need for reciprocation when direct retainers are used
12. the types and efficacy of reciprocation that may be achieved by appropriate design of implant-based prostheses
13. the importance of guide surfaces in the retention and stability of implant-based prostheses
14. the need for and principles of indirect retention when applied to implant-based prosthesis design
15. the use of the altered cast technique in improving the stability of implant-based prostheses
16. the principles of stress broken designs and their limitations
17. methods of providing obturation, the conditions that may require obturation, particular issues of retention; factors influencing the design of implant-based prostheses to provide minor obturation and how to take these into account in the design
18. the classification and sub-classification of materials on the basis of chemical composition and internal structure
19. the mechanical, physical, thermal, chemical and biological properties of materials
   1. the importance of the evaluation of materials prior to use in the oral cavity
   2. the ideal properties of materials used in the manufacture of implant-based prostheses
   3. comparison of the materials currently used in dentistry to the ideal properties
   4. the effects of storage on the properties of the materials used in the manufacture of implant-based prostheses
   5. the properties of materials during manipulation
   6. the properties of materials during setting
   7. the effects of processing on the properties of the materials
20. gypsum products for cast and mould manufacture
   1. the requirements of gypsum products used in the manufacture of casts and moulds for implant-based prostheses
   2. the composition of gypsum products used in dentistry
   3. the manipulation and setting characteristics of gypsum products
   4. the properties of the set materials used in the manufacture of casts and moulds
21. waxes used in the manufacture of implant-based prostheses
   1. the requirements of wax pattern and base materials
   2. the composition of dental waxes used in the manufacture of implant-based prostheses
   3. the properties of dental waxes used in the manufacture of implant-based prostheses
   4. the importance of solid/solid transitions in the manipulation of waxes
   5. the essential differences between baseplate waxes and casting pattern waxes
   6. the relevance of the coefficient of thermal expansion (CTE) in the use of baseplate and pattern waxes
   7. the importance of pattern strain relief in the manufacture of indirect patterns
   8. the importance of maintaining the physical, mechanical and aesthetic properties of baseplate waxes
22. dental polymers
   1. the term polymerisation
   2. the activation mechanisms that can be used in the polymerisation of polymers
3. the initiation processes that can be used in the polymerisation of polymers
4. the processes by which termination occurs in dental polymers
5. the terms step and chain polymerisation and how these may be equated to the terms condensation and addition curing
6. the terms thermoplastic and thermoset

23. structural features of polymer chains:
   1. the term copolymerisation
   2. the terms branching and cross-linking and how these relate to:
      1. the thermosetting of denture base polymers
      2. the setting of reversible and irreversible hydrocolloid impression materials
      3. the setting of rubber based and silicone impression materials
   3. transition temperatures of polymers (Tm and Tg) and their effects on the physical and mechanical properties of polymers
   4. the term tacticity and the various forms that this may take in the structure of polymers
   5. the rotation of polymer segments
   6. the effect of the degree of polymerisation on properties of polymers

24. denture base polymers
   1. the specific requirements of denture base polymers
   2. the constituents and properties of denture base polymers
   3. the constituents and properties of hard reline materials
   4. the constituents and properties of tissue conditioners and temporary soft lining materials
   5. the constituents and properties of permanent soft lining materials
   6. the microbial, physical and technical implications of the metallo-polymeric junction

25. ceramics used in dental technology including for abutments

26. dental alloys
   1. the structure and properties of metals and the methods of crystallisation in the cooling of metals
   2. the classification of titanium
   3. the benefits of combining metals to produce alloys
   4. the types of binary alloys that can form and the relevance of these structures in the use of dental alloys
   5. the importance of dislocations in the structure of metals and alloys
   6. the construction of thermal equilibrium diagrams from the cooling curves of different binary alloy compositions
   7. the important features of thermal equilibrium diagrams for alloys that form solid solutions
   8. the important features of thermal equilibrium diagrams for alloys that exhibit partial solid miscibility
   9. the relevance of the eutectic mixture on the composition of dental alloys and solders
  10. the importance of phase precipitation in alloys that exhibit partial solid miscibility on the hardening mechanisms and corrosion resistance
  11. the relevance of non equilibrium cooling conditions on the structure of alloys
  12. the importance of homogenisation heat treatments on cast alloys
  13. the relevance of refining elements on the castability and eventual crystal structure of alloys
  14. the importance of cooling cycles on the physical and mechanical properties of dental alloys
  15. the importance of primary, secondary and tertiary creep
16. the effects of cold working on dental alloys and its relevance to anisotropic properties
17. the terms stress relief anneal, recrystallisation and grain growth and its relevance to the use of dental alloys
18. the importance of maintaining the crystal structure of wrought dental alloys
19. the important principles in the soldering, brazing and welding processes used in modern dentistry
20. the relevance of electrolytic corrosion in the use of dental alloys
21. the importance of the use of electro-brightening of certain dental alloys
22. the rationale for the selective plating of dental alloys

27. artificial tooth materials

1. the ideal requirements of artificial tooth materials used in the manufacture of implant-based prostheses
2. the properties of the artificial tooth materials available for use in the manufacture of implant-based prostheses
3. the mechanisms of attaching artificial tooth materials to denture bases
4. the benefits and restrictions of combining different materials in the manufacture of implant-based prostheses

28. impression, duplicating and disinfection materials

1. the constituents and uses of different impression materials and duplicating materials
2. the compatibility of impression materials with disinfection procedures
3. the term viscoelasticity and its relevance to the handling of certain types of impression materials
4. the term elastomeric and the essential characteristics of the materials in this category

29. methods of protection against contamination and cross-infection when handling received impressions and other items which may have been in the mouth, or which are being returned and intended to be placed in the mouth; why it is important to do so

30. the purpose of personal protective equipment

31. the range of equipment used in the design and manufacture of implant-based prostheses; methods of using equipment and materials safely (including the use of chemicals and other hazardous substances); methods of storing different equipment and materials safely and securely; methods of cleaning and maintaining different types of equipment and the workers role in this

32. the particular risks of infection related to implant-based prostheses

33. the reasons for maintaining records throughout the process and of clearly identifying the products during the manufacturing process

34. organisational procedures and requirements for the recording of information about incoming work, work in progress and work delivered to clients, and the purpose of this

35. quality audit systems: their purpose, nature and procedures; impact of the Medical Devices Directive on the recording of incoming work, the detailed design and manufacturing specification and the recording of materials and processes

36. principles of quality assurance (including effective recording and sampling); processes and procedures for quality assurance in the workers workplace

37. methods of setting and calibrating equipment and of testing that this is correct

38. the effects of modifying manufacturers products to meet laboratory requirements on the physical properties of products, on quality assured products and the legal implications (eg of inaccurate mixing, inadequate processing)

39. the requirements of the Medical Devices Directive in monitoring the progress of
40. legal requirements of the contract of employment, confidentiality and employers regulations
41. health and safety at work legislation and related procedures and liability; principles of, and how to apply, legislation and regulations (eg COSHH regulations, the Health and Safety at Work Act, Environmental Protection Act)
42. legal requirements relating to third party insurance
43. legal requirements relating to the Dentists Act
44. the competency range of other members of the oral healthcare team (and the wider health and social care team)
45. the regulatory functions of the General Dental Council
46. legal and ethical obligations of regulated members of the oral healthcare team
47. the need for lifelong learning and professional development and responsibilities in relation to this for regulated members of the oral healthcare team
48. the oral healthcare teams wider responsibility to the community as a whole

PERFORMANCE CRITERIA

You must be able to do the following:

1. agree with clients the workers role in contributing to treatment planning and the diagnostic process
2. discuss with clients:
   1. the patients expectations of the implant
   2. aims and objectives of the treatment
   3. the number of appointments that the patient is likely to require and the likely schedule of the appointments and related laboratory work
   4. the approximate cost of the laboratory work
3. effectively undertake appropriate diagnostic investigations and reports
4. discuss with clients:
   1. the functional and aesthetic criteria for successful treatment outcomes
   2. technical and clinical restrictions
   3. any transitional clinical and technical procedures
5. produce surgical stents to guide the placing of the implants following discussion with the client
6. effectively clean and disinfect new primary impressions from the client
7. pour appropriate materials to form an accurate cast of the primary impression
8. confirm with the client whether the treatment is to proceed as planned or if modifications are needed to the initial treatment plan
9. construct a custom-made tray in a design that is appropriate to the impression coping
10. disinfect the custom-made tray and return it to the client for the development of a working impression
11. disinfect the working impression on receipt from the client
12. locate the implant structure replicas accurately in the impression
13. confirm the accuracy of the working impression and determine the type of cast that needs to be poured
14. produce the correct type of cast using an appropriate technique and appropriate materials.
15. effectively clean and disinfect the returned occlusal registration rim and baseplate and transfer registration information accurately to the cast
16. mount the cast on an appropriate articulator, articulate it correctly and consistently with any available occlusal registration information and record the necessary information correctly
17. transfer registration information accurately to the cast.
18. modify, position and attach the prescribed artificial teeth to the baseplate in a manner that produces:
   1. occlusion and articulation appropriate to the patients recorded jaw relationship
   2. the required aesthetic appearance
   3. a prosthesis which maximises retention, stability and support
   4. maximum masticatory efficiency
19. shape and contour the supportive wax consistent with the patient's musculature to produce trial prosthesis
20. clearly and accurately identify trial removable prosthesis with the patients unique reference and date of production
21. effectively clean and disinfect the trial removable prosthesis, prepare and package it safely for despatch and return it to the client at the agreed time
22. on receipt of the returned trial removable prosthesis from the client, disinfect, identify any required modifications and gingival remodelling
23. design the implant superstructure through:
   1. indexing tooth position (matrix)
   2. any requirements for gingival remodelling (and position the appropriate pre-manufactured components)
24. appropriately manufacture the implant superstructure
25. assess the fit of the implant superstructure and confirm that it meets the clients requirements
26. send the metallic superstructure to the client for trying in the patients mouth
27. determine the appropriate course of action on receipt of further information from the client
28. correctly replace the appropriate artificial teeth on the superstructure using matrices
29. return the superstructure with attached artificial teeth to the client for the next stage of try-in
30. on receipt of the prostheses from the client, convert the wax to polymeric materials using an appropriate flasking technique developed specifically for the individual case
31. appropriately polymerise the materials and deflask
32. appropriately trim and polish the prosthesis to create smooth and polished non-fitting surfaces and rolled borders
33. evaluate the finished prosthesis for:
   1. its quality and freedom from defects
   2. functional effectiveness to the design
   3. fit to the cast
   4. compliance with the prescription
34. correctly identify the finished prosthesis with the patients unique reference and date of production
35. effectively clean and disinfect the finished prosthesis, prepare and package it safely for despatch together with instructions for the patient and client
36. make complete, accurate and up-to-date records relating to the identification, components and manufacture of the prosthesis and store the records in the correct location consistent with relevant legislation

**ADDITIONAL INFORMATION**

This National Occupational Standard was developed by Skills for Health.

This standard links with the following dimension within the NHS Knowledge and Skills Framework (October 2004):

Dimension: HWB9 Equipment and devices to meet health and wellbeing needs