

# Standardising dental processes

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## IN BRIEF

- Dentistry is undergoing a remarkable transformation with the use of computerised manufacturing processes (CAD/CAM).
- The creation of electronic data with the digitisation of dental surfaces enables standardised process controls to be introduced.
- The use of CAD/CAM technology should become a formal ingredient in the GDC curriculum of CPD.

A global transformation is taking place in dentistry with the use of CAD/CAM based technology. Whilst the headlines in the dental press continue to be dominated by precision fitting ceramic dental prostheses it is reasonable for us to ask – how well do they fit and how good are they? These questions of course cannot be answered in the absence of any benchmarked standards. Throughout manufacturing industry, process controls are designed to deliver constant improvement and eliminate failure – everything has to be measured. The best companies retain their competitive advantage by developing and selling products that are all made within an envelope of excellence. Likewise we must be able to measure clinical excellence objectively and demonstrate the benefits to our patients.

## The traditional practice of dentistry

Dentistry over the ages has been essentially a craft based industry and indeed dental practice is described as a combination of art, craft and science. Today as technology and electronic communications advance apace so does the need to focus more upon science and the accompanying standards needed to ensure conformity.

Good teeth, good looks and oral comfort top the agendas of most civilised communities that enjoy a high standard of living. Indeed as long ago as 2650 BC the Panels of Hesire record a list of expressed wishes an Egyptian nobleman hoped he would enjoy in his afterlife that included the skills of 'the greatest of the dental surgeons'.<sup>1</sup> The clinical competence levels must have been somewhat variable in those far off times, as only the greatest skills would suffice for Hesire who appears to the experienced eye to have lost most if not all of his natural teeth in his latter years!

Whilst the NHS is not particularly active in rewarding the use of advanced dental

technology, it is the promise of superlative aesthetics and the long-term durability of properly engineered dental prostheses that are so compelling. A combination of deskilling and the automation of dental processes will be accompanied with massive quality improvements and time saving benefits. However, the piecemeal employment of computerised technology in untrained hands will not be enough to guarantee success.

## The CAD/CAM revolution

The advent of titanium implant technology was a very significant landmark in dentistry as the principles of bioengineering began to impose greater demands upon clinical skills. Further advances in computerised technology and electronic communications bring us a unique opportunity in dentistry to simplify manufacturing processes and introduce benchmarked standards. We live in remarkable times that require organisational skills and technical knowledge to be properly applied. The complex chain of events that begins and ends in the surgery encompasses on the way, a remote manufacturing process that requires rigid controls to ensure repeatability and reproducibility (R&R).

The traditional practice of treating the clinical and laboratory stages separately is fraught with danger and it is interesting to note how many commercial CAD/CAM

systems assume the accuracy of the impression can be taken on trust. Unfortunately poor preparation and a rotten impression will give a rotten prosthesis whether computers are used or not!

## Data creation

Just about every schoolboy and old age pensioner will be aware of the existence of electronic data in our digital age. What they are unlikely to know however is how these data are created and then processed to make better fitting dental prostheses. This is what every dentist and dental technologist should know and understand in very great detail. Without this knowledge a great chasm will open up and separate the old world dinosaurs from our brave new world of technology – the white heat of technology as Prime Minister Harold Wilson once described it. Being able to create specialised electronic data should today be at the heart of all advanced dental applications and solutions. Not only will the creation of properly validated dental data (digitisation) enable us to deliver state of the art dental prostheses for our patients but it will also enable us to provide a certificated audit trail. Here we have a science-based mechanism whereby clinical revalidation can be exercised as a fundamental part of all continuing professional development (CPD) programmes prescribed by the GDC.

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## Refereed Paper

Accepted 27 March 2009

DOI: 10.1038/sj.bdj.2009.474

©British Dental Journal 2009; 206: 569–570

### Dental data and scanners

Many patients who have visited hospitals for medical treatment will have experienced the benefits of 'scans' – for example Computerised Tomography or CT scans.

The rapid deployment of scanners in dental laboratories is being accompanied by a much greater understanding of the dental process. Whilst we as dentists may have reviewed thousands of dental impressions before they leave our surgeries, only those with dental laboratories or the experience of working in a dental laboratory will be familiar with the detail of creating a master model. The impression itself often obscures the flaws that become all too obvious when the replica master model is made. The digitisation of the master model surfaces accompanied by the use of specialised computer software gives us a whole new dimension – a virtual image of our clinical landmarks. The dental scanner has the potential to become the equivalent of the GP's stethoscope for diagnostic purposes and dentists themselves would be wise to prepare for

the oncoming revolution in dental manufacturing that will bring extraordinary clinical and technical benefits. The ability to harvest and transmit dental data from the dental surgery directly to a remote manufacturing facility and receive a precisely engineered framework or completed prosthesis in metal or ceramic materials accompanied by a certificate of conformity is now a reality.

### Standardising the scanning process

The traditional mechanisms for setting global BSI EN ISO standards are slow and insensitive to change. Many of the existing standards for dental materials are out of date and unable to accommodate the use of computerised technology. Indeed it is the use of CAD/CAM technology itself that has identified the fact that some dental standards are hopelessly inadequate as they employ two-dimensional testing procedures in a three dimensional environment. Discussions that took place within ISO nearly four years ago ended in disagreement with a number of experts unable

to see a need for standardising the use of dental CAD/CAM systems!

The concern today is the fact that different types of scanners and manufacturing techniques are being marketed with extravagant claims, few of which can be validated against any relevant standard. We are all familiar with the surgery and laboratory cupboards littered with redundant equipment and materials whose poor performance we ourselves have had to underwrite when the failures arrive in the surgery or laboratory for remedy free of charge. A system of flawed standards and inadequate regulation is worse than no system at all because a veneer of respectability and false trust is created whereby dentists and laboratory staff continue to purchase unproven products and materials in good faith.

Professional standards need to be improved if we are to enjoy the public confidence and trust that self-regulation demands.

1. el-Shahawy A. The Egyptian Museum in Cairo Guide text. pp 63-69.