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Weighing up the Weighted Case Mix Tool (WCMT): a psychometric investigation using confirmatory factor analysis

B.G. Duane[1], G. Humphris[2], D. Richards[3], E.J. Okeefe[4], K. Gordon[5] and R. Freeman[6]

[1]Dental Public Health, Public Health England, Horsham, UK; [2]Health Psychology, Medical School, University of St Andrews, UK; [3]Evidence-based Dentistry, Dental Health Services Research Unit, Dundee,UK; [4]Dental Public Health, NHS Greater Glasgow and Clyde, UK; [5]Special Care Dentistry, NHS Lothian Public Dental Service, UK; [6] Dental Health Service Research Unit, University of Dundee, UK.

Objective: To assess the use of the WCMT in two Scottish health boards and to consider the impact of simplifying the tool to improve efficient use. ***Design:*** A retrospective analysis of routine WCMT data (47,276 cases). ***Clinical setting:*** Public Dental Service (PDS) within NHS Lothian and Highland. ***Method:*** The WCMT consists of six criteria. Each criterion is measured independently on a four-point scale to assess patient complexity and the dental care for the disabled/impaired patient. Psychometric analyses on the data-set were conducted. Conventional internal consistency coefficients were calculated. Latent variable modelling was performed to assess the 'fit' of the raw data to a pre-specified measurement model. A Confirmatory Factor Analysis (CFA) was used to test three potential changes to the existing WCMT that included, the removal of the oral risk factor question, the removal of original weightings for scoring the Tool, and collapsing the 4-point rating scale to three categories. ***Results:*** The removal of the oral risk factor question had little impact on the reliability of the proposed simplified CMT to discriminate between levels of patient complexity. The removal of weighting and collapsing each item's rating scale to three categories had limited impact on reliability of the revised tool. The CFA analysis provided strong evidence that a new, proposed simplified Case Mix Tool (sCMT) would operate closely to the pre-specified measurement model (the WMCT). ***Conclusions:*** A modified sCMT can demonstrate, without reducing reliability, a useful measure of the complexity of patient care. The proposed sCMT may be implemented within primary care dentistry to record patient complexity as part of an oral health assessment.

Key words: *special care dentistry, Bateman tool, weighted case mix tool, commissioning*

Introduction

Within Scotland the Public Dental Service (PDS) incorporates the functions of both the Community Dental Service and the Salaried Dental Service (NHS Scotland, 2006). A significant part of the role of the PDS is to provide care for adults with special needs. Indeed, in a recent audit of the NHS Lothian PDS (excluding its access centre activity) it was demonstrated that 63% of all adult patient appointments were for patients having a special need category (NHS Lothian Special Care Dentistry, 2013).

The British Society of Disability and Oral Health (2007) published guidance on Commissioning for Special Care Dentistry to highlight the need for heightened awareness of the complexities of special care dentistry. Additional time and resources are required to provide the desired level of patient management and dental care for this heterogeneous group. The PDS in Scotland treats patients who present considerable challenges by virtue of their physical, mental and or systemic condition. Many of these challenges require the skills of specialists in special care dentistry; a specialty that was recently recognised by the General Dental Council in its own right (Lyall, 2008).

To compare the activity of the independent dental sector and its PDS counterpart, consideration needs to be given to the skewed practice of the complexity of care within the PDS. (Fiske, 2006) If the differences in case load complexity between the two different groups of patients can be readily captured then a more reliable assessment of the resource required to manage and treat people with special needs can be made.

The British Dental Association's (BDA) Weighted Case Mix Tool (WCMT), as proposed by the British Society for Oral Health and Disability, was developed by Bateman and colleagues as part of the evolution of a 'tool kit' for commissioning special care dentistry in Primary Care Trusts.

The WCMT allows objective assessment of the complexity of the provision of care for people with disability through a structured matrix. It evaluates patient complexity, rather than the complexity of the dentistry being provided, using six independent criteria that indicate a measurable level of patient complexity. The criteria are; ability to communicate, ability to cooperate, medical status, oral risk factors, access to oral care, and legal and ethical barriers to care (Table 1). Each criterion is measured independently on a four-point scale (where zero represents an average 'fit and well' individual and A, B and C represent increasing levels of complexity) and covers both actual provision of clinical care and the additional pieces of work needed to facilitate care for many disabled patients. Within each criterion weighting is applied. As an example; a weighting of '4' is given to the ability to communicate criteria of (i) if 'B' is chosen. Anecdotal reports suggest that dentists demonstrate substantial variation when using the WCMT.

Correspondence to: Brett Duane, Public Health England, Kent Surrey Sussex, Horsham, RH12 1XA, UK. Email: brett.duane@phe.gov.uk

Table 1. WCMT criteria, four-point scale and weighting

Criteria	*Scale with weighting*			
i. Ability to communicate	O 0	A 2	B 4	C 8
ii. Ability to co-operate	O 0	A 3	B 6	C 12
iii. Medical status	O 0	A 2	B 6	C 12
iv. Oral risk factors	O 0	A 2	B 4	C 8
v. Access to oral care	O 0	A 2	B 4	C 8
vi. Legal and ethical barriers to care	O 0	A 2	B 4	C 8

If the WCMT is to be used more widely, it is important that any source of non-systematic or error variation is reduced. Moreover, the WCMT generally takes about forty seconds for a PDS clinician to complete. It is important that completing a tool such as the WCMT is an efficient process. Hence, attempts to simplify the process of using the WCMT might promote dissemination of the tool and widen adoption.

The error variation within the WCMT may be reduced by training; however Burgess and colleagues (2011) suggest the WCMT requires further development, to improve its validity and reliability. Such development may also reduce the time it takes to complete the WCMT process.

The aim of this study was to assess the use of the WCMT in two Scottish NHS Health Boards and to consider the potential impact of simplifying the WCMT to improve efficient use.

Methods and materials

Two NHS Boards were purposely chosen to access the WCMT routine collected data. These two NHS Boards represented an inner city NHS Board (NHS Lothian) and a remote-rural NHS Board (NHS Highland) and were chosen as they routinely collected WCMT data. The dental health professionals in these two NHS Boards had been formally trained by Bateman or Gordon in the use of the WCMT. Caldicott Guardian approval was given for the data analysis by both NHS Health Boards.

The WCMT data for NHS Lothian and NHS Highland was collected from Kodak R4™ software for the one year period from 13th February 2011 to 12th February 2012. R4 provided the research team with the routinely collected data for the WCMT by specific clinic within the NHS Board, and by treating clinician. The routine data were anonymised before being transferred for analysis, as required by the Caldicott Guardian. This was performed by the NHS Lothian analytical service for the extraction, re-configuration and anonymisation of the data prior to analysis.

The technique of Confirmatory Factor Analysis (CFA) was used to understand the structure of the WCMT measure. CFA provides an elegant way of generating hypotheses about how various criteria are related (Brown, 2011). The technique is a sophisticated correlational-causal mathematical testing of a model compared against a raw data set. Essentially, the method relies on the investigator generating a measurement model and testing this model against the raw data that have been collected. The great advantage of the procedure is that the inherent errors within the assessment by the clinician can be systematically studied, an issue ignored in the more conventionally used exploratory factor analysis (EFA) procedure. EFA by comparison is a 'hands-off' procedure with no *a priori* measurement model specified by the researcher. It, typically, does not allow the investigator to test how good the raw data conforms to the resultant factor structure derived from the simple correlation or covariance matrix. Hence CFA is the preferred technique in this instance, particularly as the assessment of complexity is understood theoretically as a single dimension (Thompson, 2004).

Statistically, the method has enormous advantages over the commonly applied factor analysis as the investigator can specify the method of analysis to disregard the usual assumptions of normality in the distribution of each of the answers provided by the clinical assessors. A distribution free method (that is with no normal distributional assumptions) provides the researcher with greater confidence in their findings without the usual caveats or limitations that would sensibly be required with more traditional maximum likelihood methods of estimation.

If the proposed case mix tool was to be applied to general dental practice, it would be expected that the majority of patients will likely be classified into low complexity. Some will be classified as exhibiting some moderate complexity. The percentages of highly complex treatment needs within the WCMT are comparatively small therefore, statistically speaking, the categories are likely to be heavily skewed, and lack normal distribution. The statistical routines for the CFA made no assumptions of normality of the statistical distribution or the interval width between each category. The distribution free estimator (ADL) was employed in the calculations by the software package AMOS v.19. The disadvantage of the ADL estimator is the requirement of having large sample sizes to derive precise estimates of all parameters. The strength of the current study is the widespread use of the WCMT in the two health board areas enabling a close correspondence to the large sample sizes needed. To gain an impression of the sample required for this type of analysis a power analysis using MacCallum's *et al*. (1996) method found that a sample of over 7,250 patients would be required for the CFA model with a given power of 0.90 at a significance level of 0.05, with 6 degrees of freedom, to test the hypothesis of perfect fit (null hypothesis H_0: Root Mean Square Error of Approximation (RMSEA=0.00) versus close fit (H_a: RMSEA=0.02). In addition, a sample size of 9,000 in an attempt to reveal even very small changes of RMSEA (that is at 0.0001), with the degrees of freedom changing by 3, would provide exemplary power equalling better than 0.99. Thus the samples available in the current study are more than adequate for running these statistical models and obtaining very precise estimates of fit.

A Confirmatory Factor Analysis (CFA) of the secondary data from NHS Lothian and NHS Highland was undertaken to conduct a detailed examination of the measurement performance of the WCMT and to consider; 1, the appropriateness of the weighting used with the WCMT; 2, the utility of each question used within the WCMT and whether it increases the reliability of each question; and 3, the simplification of answers O, A, B, C to O, A and B/C.

For each data set the following analysis strategy was applied. Firstly, Cronbach's alpha coefficients were calculated for each version of the case mix tool (WCMT and Simplified Case Mix Tool, sCMT). This coefficient essentially computes the average of all inter-item correlations and then introduces a correction factor to account for the number of criteria comprising the measure. The advantage is that the coefficient is widely applied and hence measurement scientists are able to make comparisons and judge the strength and weakness of the measure under investigation. It is known as an estimate of internal consistency, as each criterion that comprises the measure can be considered as a further attempt to assess the component or construct of interest. It is similar to a scientist making multiple measurements to produce more precision through using the average of all measurement attempts. The alpha coefficient is considered as the 'upper-bound' of reliability, whereas the 'test-retest' coefficient can be regarded as a 'lower-bound' estimate (Streiner and Norman, 1992). According to Bland and Altman (1997) a level of 0.7 would by convention be acceptable for group comparison purposes for reliability coefficients.

Then, as per Kline (1998), a measurement model was constructed with all criteria being described by a single latent variable (named the WCMT). A latent variable is a hypothetical construct that is inferred from the discrete values that the indicators, or in this report, criteria, hold. The relationship between the indicators/criteria is not simply a one-to-one summation of their raw values but the addition of the raw score with an associated error term. The introduction of error is considered more theoretically sound and more likely to reflect reality. An added advantage is that the errors can be allowed to correlate with other parameters within the model. The inclusion of a small number of correlated errors provide another example of the investigator being able to mimic reality, as assessments rarely hold to the exacting assumption of error or 'disturbance' terms being entirely independent. All estimates of the links between the latent variable and criteria were allowed to be freely estimated, with the exception of one of the criteria whose loading was pre-specified to unity to 'set the scale' of the measure. (Thompson, 2004) According to CFA modellers the selection of the actual item (or 'criteria' as we have named our items in this study) that is fixed in this way is arbitrary but essential for the structural equations to resolve through a complex iterative process that modern computers now enable an investigator to apply. The investigator can make sense of the degree of fit of the applied measurement model by referring to a set of 'fit' indexes that reflect the ability of the model to describe the raw data. A conventional measure of fit is chi-square with the larger the value of this statistic showing poorer fit. The interpretation of chi-square is made difficult however with the common finding that with large sample sizes, even small chi-square values become significant, hence other fit indices have been developed. The authors of this study chose standard recommended indices and levels of fit including: the Comparative Fit Index, Root Mean Square Error of Approximation with values set at 0.95 and 0.05 respectively (Hu and Bentler, 1999). CFA was applied to the original WCMT (6 criteria), a modified CMT (1) (with four categories and six criteria), the modified CMT (2) (five criteria and four categories) the simplified CMT (three categories and five criteria). The later analysis was explored further by employing two different methods of collapsing the four category answering system into three. Method 1 was collapsing the O-A-B-C system into O-A-B/C and Method 2 into O-A/B-C. Method 1 was considered to be more acceptable as there were lower percentages of the category C answers and this made sense to combine to the lower rated category, namely category scored as B. However the two methods were run for the sake of completeness.

Results

The Weighted Case Mix Tool (Bateman *et al*., 2010) routinely collected data was obtained from 47,276 cases, with 9,140 from NHS Lothian and 38,136 from NHS Highland.

Table 2 shows the Cronbach alphas for the original WCMT (WCMT 1) using the recommended weighting for the routine collected data from NHS Lothian and NHS Highland. There was little difference in the Cronbach alphas using the recommended weighting when criteria 4 (oral health) was removed (WCMT 2), however the Cronbach alphas improved for WCMT versions 3 (with all five criteria included) and four (with criteria 4 omitted) when the recommended weighting was replaced with a non-weighted linear 4 point scale from 0 (no complexity) to 3 (extreme complexity). The Cronbach alphas did not change when the linear scale was collapsed into a 3-point scale (0 to 2) as in WCMT versions 5 to 8. The analysis was repeated with a 3-point scale with, the categories 2 and 3 collapsed (vs. 5 and 6). *A priori*, version 5 makes more logical sense as the proportion of code Cs is low (<7%). Therefore the loss of information of including category C codes into the category B codes would not be great. Also it demonstrates that the decision between assigning an individual into codes B or C may be doubtful and, consequently, the reliability improvement of retaining the codes B and C as separate may be, possibly, very low. Hence collapsing codes B and C appears to have merit. The advantage of this three category system is that the clinician is invited to simply rate their patient on 'severe', 'moderate' or 'no'. The collapsing of the middle categories was also conducted (that is from 0-A-B-C to 0-A/B-C) (vs. 7 and 8). The resulting alphas were virtually unchanged between the 5 and 6 criteria versions (vs. 7 and 8 respectively) however the collapsing of the extreme category C (vs. 5 and 6) provide a consistent higher reliability to the mid-rating transformation (vs. 7 and 8).

The confirmatory factor analysis (CFA) results show a virtual 'close fit' from both samples as shown by the low RMSEA values (≤0.04) (Table 3). The degrees of freedom for the original WCMT solution in the two health board samples differed by one due to an extra error covariance (that is, correlated error) included in the NHS Highland data. It will be noted that the sCMT versions are appreciably better in terms of fit than the original WCMT (Table 3).

In Figure 1 the simplified Case Mixed Tool (sCMT) structural model is presented by way of illustration of the

Table 2. Cronbach Alphas for the original WCMT (v.1) including weighting for NHS Highland and NHS Lothian

Version and description	*NHS Lothian n=9,140*	*NHS Highland n=38,136*
1. Full WCMT weighting	0.692	0.687
2. Full weighting without Q4	0.611	0.674
3. Simple rank order (0-A-B-C rating)	0.768	0.747
4. Simple rank order (0-A-B-C rating) without Q4	0.729	0.759
5. Simple rank order (reduced range 0-2) recoded as 0-A-B/C	0.786	0.745
6. Simple rank order (reduced range 0-2) recoded as 0-A-B/C without Q4	0.760	0.772
7. Simple rank order (reduced range 0-2) recoded as 0-A/B-C	0.742	0.715
8. Simple rank order (reduced range 0-2) recoded as 0-A/B-C without Q4	0.710	0.743

Table 3. Confirmatory factor analysis results for the four coding schemes for the Weighted Case Mix Tool and simplified versions

Sample and weighting	*Chi-sq*	*df*	*p*	*CFI*	*RMSEA value*	*95%CI*
NHS Highland sample (n=38,136)						
WCMT original weighting (6 criteria)	127.6	6	0.001	0.910	0.025	0.022,0.029
Simple rating 0-A-B-C (5 criteria)	47.3	3	0.001	0.958	0.020	0.015,0.025
Simple rating 0-A-B/C (5 criteria)	48.2	3	0.001	0.965	0.020	0.015,0.025
Simple rating 0-A/B-C (5 criteria)	26.8	3	0.001	0.983	0.014	0.010,0.020
NHS Lothian Sample (n=9,140)						
WCMT original weighting (6 criteria)	75.5	5	0.001	0.967	0.039	0.032,0.047
Simple rating 0-A-B-C (5 criteria)	21.0	3	0.001	0.981	0.026	0.016,0.036
Simple rating 0-A-B/C (5 criteria)	19.7	3	0.001	0.987	0.025	0.015,0.040
Simple rating 0-A/B-C (5 criteria)	27.3	3	0.001	0.980	0.030	0.020,0.040

Notes: Chi-sq, Chi-Square statistic; df, degrees of freedom; CFI, Comparative Fit Index; RMSEA, Root Mean Square Error of Approximation; CIs, Confidence Intervals

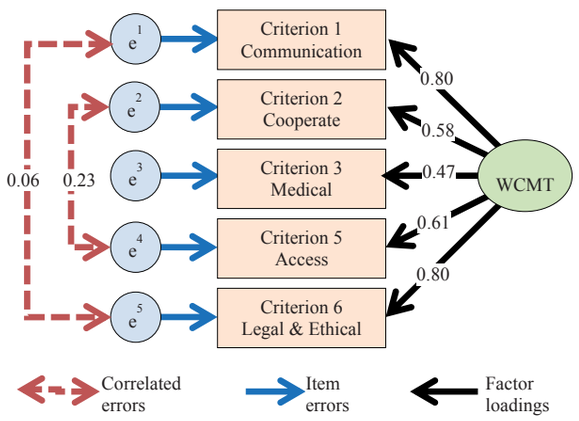

Figure 1. *Presentation of the simplified Case Mix Model (sCMT)*

measurement model using the NHS Lothian data since the solution derived from the NHS Highland data was virtually the same (Table 3). The ellipse describes the 'latent variable' sCMT with the equivalent of loadings (the standardised coefficients: 0.80, 0.58, 0.47, 0.61, 0.80 from criterion 1 to criterion 6, with criterion 4 omitted) labelling each of the arrows linking the five criteria of the tool (Figure 1). These standardised coefficients are akin to the factor loadings that readers may be more familiar with in traditional factor analyses. Note that the measurement errors (circles) are explicitly included in the measurement model and estimated as part of the CFA. Furthermore, the modelling has included two sets of error co-variances to be allowed to correlate, denoted by the double headed broken lines. These specify that there are small but significant associations between the criteria with the correlated errors that are not expressed by the single latent variable of sCMT. These were identified explicitly by the software that indicated that removing the constraints on these two pairs of error terms would assist the model fit. That is the pairs of errors were allowed to correlate rather than remain independent as would have been the case with traditional EFA methods. The fact that these correlated errors have been introduced enable the investigator to appreciate that the measure has considerable strengths as the factor loadings are very high and significant between the criteria and the latent variable, but also provides a necessary description of reality by pin-pointing elements of the measure that do not fit exactly. The diagram presented is simplified for presentation purposes; the other models are not displayed for reasons of space. However the presented diagram reflects closely the overall set of findings from these analyses and does not present an over-inflated biased choice. In support of this description it was observed that the statistical fit between the raw data from two very different regions of Scotland and the proposed 'model' produced nearly identical solutions.

Discussion

The aim of this study was to assess the use of the WCMT in two Scottish health boards and to consider the potential impact of simplifying the tool to improve efficient use. The alpha readings shown in Table 2, give a measure of internal consistency and reliability of the different coding schemes for the WCMT. There are three changes that have been proposed to the WCMT, removal of the weighting, the omission of Q4 and a proposed 0-1-2 system of answering. These three changes appear to make only minor differences to the alpha readings. On close examination the analysis demonstrates that the removal of the weighting to a simple rank order improved rather than reduced the overall reliability coefficient of the assessment of the WCMT. The large sample sizes available to the research team provided a reassuring level of precision to the estimation of this internal consistency statistic. The confidence intervals for these coefficients, especially the NHS Highland sample, were virtually zero. From inspection of the coefficients, the authors suggest that the 0-1-2/3 coding of the simplified version of the WCMT (sCMT) should be adopted. Table 4 shows the coding has been converted to a simple None (O), Moderate (A) or Severe (B/C) structure. For detailed information for each point on the scale go to Appendix 1. The simplification of the answering scheme to the 0-1-2 system may reduce the degree of intellectual analysis required to calibrate each of the criteria to the patient presentation. Such a reduction in work demand with the introduction of this scheme may assist planners in encouraging staff to adhere to completing the tool routinely.

In the sCMT the oral risk factor item has been removed as this did not add to the reliability of the original WCMT in assessing complexity of patient management and dental care. The original WCMT's four-point scale has been collapsed to a three-point scale in the sCMT. The three-point scale has the advantage of simplicity as the clinician is invited to simply rate each item as None (O), Moderate (A) or Severe (B/C).

The CFA results were reassuring as the five criteria version of the proposed sCMT behaved very closely to the ideal one-dimensional scale that psychometricians would recommend. Small correlated errors were programmed into the analysis to take account of small strains in the model which are not uncommon in the process of measure development. It is important to stress that the purpose of these is simply to show that certain wording or phrases used in the scale produce effects in the structures of answers that do not endorse completely the equality of variances from the latent variable to the indicator and that small irregularities occur that are to be expected. In other words, the nature of the wording of each criterion has some unique quality that when clinicians provide their assessment it is not surprising that the ratings do not follow exactly the strictures of the mathematical psychometric model supplied in the analysis. Should these correlated errors or 'disturbances' become large then the structure of the tool would have changed and a scale of possibly two factors would have been configured to fit the data derived from the tool. The evidence presented with these two substantial data sets presents a compelling case for keeping the assessment relatively straight-forward with five criteria only and a 3-point answering scheme.

The weighting scheme for the original WCMT was developed by an expert working group at its inception (British Dental Association, 2010). The statistical analysis presented here has clearly indicated that the weightings add no advantage in demonstrating patient management and dental care complexity. In fact, removing them seems to improve the overall reliability.

One of the original purposes of the WCMT was to measure patient complexity within the primary dental care in order to appropriately compensate for managing these patients, many of whom could be managed within primary care. The more efficient measurement of patient complexity would also support the coordination of care of people with special needs within the proposed three tier dental service developing within NHS England (RCS, 2012).

The WCMT in its current format provides detailed information for the Public Dental Service to help with service and treatment planning. It does, however, take time to complete for each patient and how this time commitment would be accepted by general dental practice is unknown. If funding authorities wish the general dental service to adopt and complete the WCMT to aid in differential financial support, they may also need to consider the implications that this may have for the practices.

The proposed sCMT should reduce the time burden required for dentists within the PDS (in Scotland), the Community Dental Service (in England, Wales and Northern Ireland) and the GDS in the UK. It is anticipated that the sCMT would be simpler and quicker to complete because only 5 criteria are required to be assessed, paving the way for its possible implementation by funding authorities to enable differential and supportive remuneration of patients with special needs. This may enable more appropriate funding of services which provide care to populations with special needs.

This study has limitations as the field work was conducted using the original instructions for the WCMT. The authors have been made aware by an anonymous reviewer of simplified instructions for the original measure which might have improved the reliability of the WCMT. The proposed sCMT will also require a set of modifications to the original instructions. Additional data sets are required to support the findings presented in this paper to derive a tool that serves the various stakeholders including the patient group, service providers and commissioners.

Table 4. Simplified Case Mix Tool's criteria and weightings

Criteria	*Three-point scale*		
	None (O)	*Moderate (A)*	*Severe (B/C)*
i. Ability to communicate	□	□	□
ii. Ability to co-operate	□	□	□
iii. Medical status	□	□	□
v. Access to oral care	□	□	□
vi. Legal and ethical barriers to care	□	□	□

Conclusions

Adoption of this more easily applied sCMT should increase its efficiency by reducing the time it takes to complete and making assessments more reliable. Use of the sCMT, with appropriate training and support, may assist in refining funding mechanisms for general dental practitioners to adopt the sCMT and provide continuous and holistic care for special care patients.

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Appendix One: Simplified Case Mix Tool criteria in detail

None (O)	*Moderate (A)*	*Severe (B/C)*
Ability to communicate		
Free communication with adequate understanding between patient, carer and dental team	*Mild restriction* Some difficulty in communication but can overcome with or without use of aids. In most situations patient can communicate for themselves without intervention of 3rd party. Patient speaks English but not as first language. Patient has mild learning difficulty. Patient has hearing impairment eg lip reads.	*Moderate/Severe restriction* Patient does not speak English and requires services of interpreter to communicate. Limited communication possible. Problems with communication not able to be completely overcome. Patient requires communication in writing; using sign language/ Makaton or other communication aids. Patient communication requires carer as interpreter. Patient has moderate learning difficulty. Patient has mild dementia No ability to communicate. All discussions regarding treatment conducted through a 3rd party. Patient has profound learning disability. Patient has advanced dementia. Patient with advanced Huntingdon's disease. Patient with severely debilitating brain injury.

Ability to cooperate

Not restricted. Full co-operation for treatment possible.	*Some difficulty in co-operation* Able to complete examination but not all other procedures required in episode of care. Treatment completed with a limited amount of interruption. Patient requires up to 50% longer appointment length to complete treatment (in comparison to code 0). Patient requires up to 2 behaviour modification/acclimatisation visits before treatment commences.	*Considerable or severe difficulty in co-operation* Limited examination, or examination only possible under GA. Formal risk assessment relating to any physical intervention that maybe required. Considerable interruption disrupts provision of treatment. Additional precautions required because of violent or inappropriate behaviour. Patient requires more than 50% longer appointment length to complete treatment (in comparison to code 0). Patient requires 3 or more behaviour modification/acclimatisation visits. General anaesthetic or sedation required for treatment.

Medical History

Adequate medical history obtainable at appointment with no significant relevance to this course of treatment. No additional investigations required.	*Some treatment modification required.* Medical history obtained but some slight modifications to patient management required e.g. antibiotic cover, prescription needed.	*Moderate or severe impact of medical or psychiatric condition on provision of care.* Complex medical condition severely affects the ability to treat and choice of treatment. Tests and special arrangements are necessary e.g. steroid cover, INR. Medical or psychiatric history not able to be obtained without additional investigations and enquiring with other health and social care workers. Medical status unstable affecting provision of dental treatment eg unstable epilepsy, unstable diabetes. Complex medical history requiring multidisciplinary review in order to decide whether or not to treat and precautions required, eg case conferences, joint review with anaesthetists.

Access to Oral Care

Unrestricted Patient can access surgery without staff intervention. Child accompanied by a parent.	*Moderately restricted.* Patient can access surgery but needs support eg needs taxi, needs carer to bring them. Patient who arrives using a wheelchair - can transfer to dental chair themselves or with minor assistance. Patient who has difficulty keeping appointments by virtue of their impairment or disability. Patient whose arrangements for appointments need to be made with a carer. Patient seen in a mobile dental surgery. Patient who has difficulty getting into and out of the surgery and/or the dental chair. Patient who fails to attend, or cancels at short notice, more than once in a course of treatment	*Severely restricted or domiciliary care required* Patient requires our staff to arrange transport in order to attend surgery. Patient who needs to be treated whilst in a wheelchair eg using a wheelchair tipper. Patient who requires the use of a hoist to transfer to the dental chair. Domiciliary care required Patient treated at home, or in a hospital or nursing home bed

Legal and Ethical Barriers

No legal or ethical issues affecting care; e.g. No problems with consent or parental responsibility.	*Some legal/ethical difficulties may arise.* Looked after children. Parental responsibility requires further clarification. Financial responsibility requires further clarification. Clinician required to make a best interests decision not requiring a second opinion.	*Moderate legal/ethical difficulties may arise.* Children in foster care. Fluctuating capacity to consent due to psychiatric illness. Consultation with other professionals/carers/relatives required in order to determine patients' best interests/capacity to consent. Clinician required to make a best interest decision requiring obtaining a second opinion. Multi-professional consultation required in order to overcome legal/ethical difficulties. Best interest meeting/case conference required.