Capitation care fee banding: aspects of reliability and validity of an online tool

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Key points

- Improves understanding of the practicalities of funding oral healthcare through capitation payments.
- Illustrates that valid and reliable protocols can be developed to support risk-based banding for capitation payments.
- Underlines that capitation funding systems facilitate a preventive approach to care for both clinicians and patients.

Aim To investigate aspects of reliability and validity of Denplan/Previser Patient Assessment (DEPPA) capitation fee code guidance through a population study and to discuss some of the practicalities of effective capitation funding. **Methods** A form of 'test-re-test' reliability analysis was conducted on the DEPPA database. The fee code spread for the first 10,000 patients assessed using DEPPA (in 2013) was compared with the most recent 10,000 patients assessed (in 2017). The hypothesis was that, if these two populations, on average, have a similar oral health status it would be expected that the fee code spread should remain in a similar proportion for the two populations. Statistical checks were also performed on the database to confirm that the specific construct of Denplan Care fee code guidance was being represented by results delivered by DEPPA. **Results** The percentage of patients assigned by DEPPA into each of the five fee codes (A–E) remained consistent between the 2013 and 2017 groups. Both groups had the same oral health status as measured by the Oral Health Score (OHS) component of DEPPA (average OHS=78 for both groups). Further statistical analysis suggested that the defined concept of Denplan Care fee code guidance was being represented by DEPPA. **Conclusions** Reliable capitation fee banding increases the viability and fairness of this funding system, which in turn facilitates a preventive approach for both patients and dental teams. Patient assessment systems such as DEPPA can provide reliable and valid capitation fee code guidance.

Background

Healthcare funding models vary across the world. Capitation models involve regular payments by patients, employers or governments, in order to support prevention-based care plans aimed at achieving and/or maintaining health. Such an approach lends itself to the modern era of precision medicine, where healthcare provision is individualised, based upon individual risk assessment and biomarker analysis to target prevention and treatment strategies that consider individual variability. Precision personalised medicine embraces recent advances in research which enable both assessment of disease risk, understanding disease mechanisms and prediction of optimal therapies, initially for cancers, but also for non-communicable diseases of ageing.[1]

Zickert *et al.* conducted a study on the use of a risk-based capitation plan to care for adult dental patients in a Swedish public dental service and found that 98% of the patients who were surveyed (based on more than 750 responses) after participating in the trial preferred the capitation model to fee per item models.[2] In this trial three fee bands were employed (high risk, medium risk, low risk). The authors concluded that: 'The capitation model of care stimulated both dentists and patients to apply existing preventive knowledge'.

A UK trial conducted to compare capitation payments for the care of children with a fee per item system also concluded that capitation offered dentists more clinical freedom, which resulted in the provision of more preventive care.[3]

Similar conclusions were made in a US study assessing the care patterns of patients in capitation versus patients in fee-per-item contracts being cared for by the same clinician.[4]

Capitation systems have their critics, who cite studies that have demonstrated 'supervised neglect' can arise when practitioners are not funded by intervention; however, in today's digital world, this seems a moot point because modern public health systems offer big data that can be interrogated to identify outlier practices and risk-based targeted audits can be employed to assess standards of care. It is also now widely accepted that capitation systems are capable of producing optimal conditions for effective prevention by both clinicians and patients.

In the UK, the General Dental Council's *Standards for the dental team*[5] aim to ensure that dentists are mandated to take a preventive approach. Standard 4.1 states: 'You must take a holistic and preventative approach to patient care which is appropriate to the individual patient.'

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The Steele Review of NHS dental services in England[6] supported a significant role for capitation funding models to encourage a preventive approach to oral healthcare, with fees weighted to accommodate 'practice profiles'. They suggested that as many as ten bands of patient charges might be required, and such an approach is being piloted at the present time.

In theory, capitation care fees could simply be set at the same level for all patients, a concept underpinned by the 'swings and roundabouts' model, whereby practitioners would have good financial outcomes from patients with low needs, which would offset poorer financial outcomes from caring for high needs patients. However, such a simplistic model would be unlikely, in the opinion of the authors, to work well in dental practice because:

1. Practitioners would be incentivised equally to provide care for low needs patients over those with high needs, with no financial incentive to care comprehensively for high needs patients
2. If patients were paying their own fees, or contributing to them proportionately, lower needs patients would be discouraged to 'register' for care as there would be no financial incentive for patients to lower their risk status by making positive lifestyle and behavioural choices.

Most models of capitation funding have therefore sought to categorise patients into fee bands according to an assessed likely ongoing need for care. A less diverse 'swings and roundabouts' philosophy still needs to be accommodated within the fee bands in such a capitation system. The more bands that are accurately employed the more bureaucratic – and therefore costly to administer – a system becomes. The authors suggest that in an effective capitation system, each band is ascribed with a notional annual care time allowance for a typical patient, which is assigned to it based on the assessment protocol employed. This supports the fee setting process using a less cumbersome model, but retains incentivisation for patients to lower their risk scores (and therefore fee banding), by making positive lifestyle choices.

Denplan Care in the UK is a banded capitation system which has now been in operation in the private sector for more than 30 years. Around 1.1 million patients are registered and from the outset in 1986 Denplan Care has used five fee bands (A–E). Patients have traditionally been banded primarily according to the quantity of restorative care evident in their dentition, and their periodontal condition. The gradient ranges from patients assessed as low needs in group A, through to those in group E who are likely to have a considerable ongoing need for care.

Table 1 A summary of the points system used for fee code guidance in DEPPA

Restorative status points per tooth	
Tooth with simple restoration	1
Tooth with complex restoration	2
Root filled tooth	2
Tooth with crown post	2
Removable prosthetic tooth	1
Fixed prosthetic tooth	2
Periodontal status points per tooth	
Severe periodontal disease	35
Moderate periodontal disease	20
Mild periodontal disease	10
Gingivitis only	5
Healthy	0
Future disease risk points for each of caries, periodontal disease, tooth wear and oral cancer	
Very high risk	5
High risk	4
Moderate risk	3
Low risk	2
Very low risk	1

The points are totalled to give a fee code recommendation as follows:					
Band	A	B	C	D	E
Points	0-14	15-34	35-60	61-81	82 and above

For the last thirty years, Denplan, now known as Simplyhealth Professionals, has recommended that patients are accepted for capitation care at a point at which they could be considered to be 'dentally fit', that is, their capitation fee supports a personalised maintenance care programme and does not include the corrective therapy required to achieve a status of 'dentally fit'. Therefore, patients are not usually accepted into the programme while in need of any professional oral health care interventions in the short term. However, the programme recognises that ongoing care needs will vary considerably, even from a rather arbitrary point at which the patient is relatively stable.

Each individual practitioner is able to set the fee charged for each band according to their practice costs and to review these fees annually. These practice costs will take into account the skill mix employed in the practice to provide patient care. The ultimate decision on the fee banding of any patient is at the discretion of the practitioner and fee banding protocols are offered for guidance.

Five years ago, in partnership with Oral Health Innovations Ltd (the UK licence holders of PreViser technology), Denplan launched an online patient assessment tool, the Denplan PreViser Patient Assessment (DEPPA) system. Busby *et al.*[7] described the development of DEPPA's three elements:

1. The 'Oral Health Score' (OHS) which measures the patient's oral health status. Perfect oral health is assigned a score of 100. Six aspects of oral health contribute to this composite score:
   - Patient perceptions (comfort, function and appearance) max score = 24
   - Soft tissues max score = 8
   - Occlusion max score = 8
   - Tooth wear max score = 12
   - Tooth health max score = 24
   - Periodontal health max score = 24

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Fig. 1 Comparison of the percentage of patients in categories A–E from the first 10,000 patients (2013) and the 10,000 patients assessed in 2017

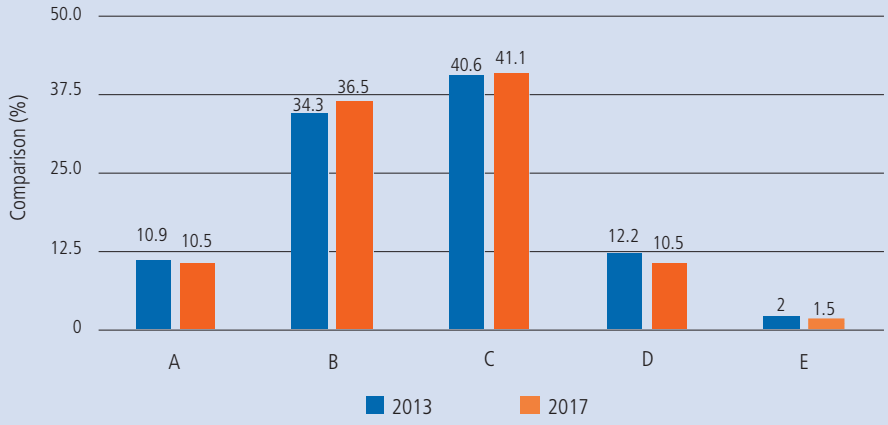
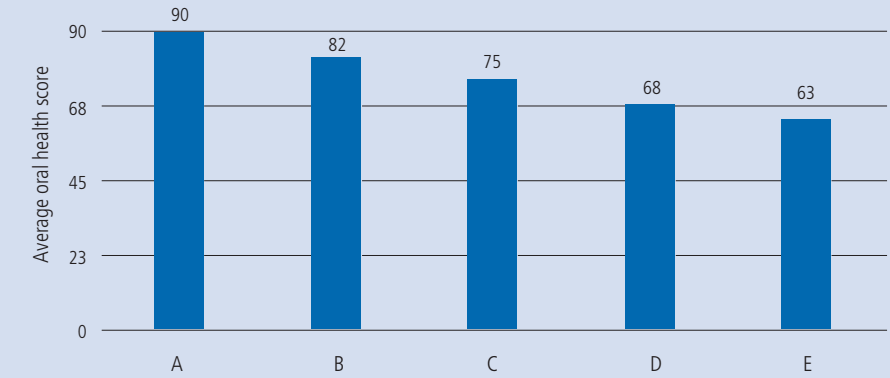


Fig. 2 Average oral health score (rounded to the nearest whole number) for fee bands A-E in the DEPPA database



2. The PreViser future disease risk scores, measuring the patient's risk for caries, periodontal disease, tooth wear and oral cancer. For each condition the scoring is:
   - Very low risk 1
   - Low risk 2
   - Moderate risk 3
   - High risk 4
   - Very high risk 5
3. A new calculation of the indicative Denplan Care fee band (A-E).

This revised fee band calculation assigned a higher weighting to periodontal disease severity than the traditional protocol and introduced weighting for future disease risk based on the PreViser risk scores. Table 1 summarises the points system used by DEPPA to recommend fee categories.

The use of DEPPA is voluntary for member practices. Nonetheless, since 2012 more than 100,000 patient assessments have been completed. These data are held in an encrypted format so that only the treating practice can identify individual patients. However, all data are available for anonymised population studies.

The aim of this paper is to investigate aspects of reliability and validity of the DEPPA fee code guidance through a population study and to discuss some of the practicalities of effective capitation funding. The definition used for reliability for the purpose of this investigation was: 'The degree to which an assessment tool produces stable and consistent results'.

The definition used for validity for the purpose of this investigation was: 'The degree to which an assessment tool actually measures the construct intended'.

Capitation fee setting is a complex construct because of the multitude of practice variables, some of which are discussed above. However, DEPPA seeks to calculate capitation fee banding rather than actual fees which is potentially more straightforward. The authors have investigated the validity of the following capitation care fee banding construct:

1. Patients initially accepted into care are not assessed to be in need of any professional oral health care interventions in the short term (guide = three months)
2. Five fee bands will be employed: A, B, C, D and E
3. Each band will represent a group of patients presenting with similar oral health status and future risk metrics, so that a notional annual care time commitment can be defined by the average values of the group
4. The progression of average oral health status and disease risk data defining the notional time needs will follow an approximately linear relationship from low need in group A to high need in group E.

Methods

A form of 'test-re-test' reliability analysis was conducted on the DEPPA database. The fee code spread for the first 10,000 patients assessed using DEPPA was compared with the most recent 10,000 patients assessed. The hypothesis was that, if these two populations, on average, have a similar oral health status it would be expected that the fee code spread should remain in a similar proportion for the two populations.

The database was also interrogated to compare average oral health scores for patients in each of the five bands. The construct tested was that the average oral health score should be seen to fall in an approximate linear fashion from the lowest need group (A) through to the highest need group (E).

The average value of three aspects of the oral health score was analysed for each band: periodontal health, tooth health and patient perceptions (which make up 72% of the total OHS and could be held to be the best indicators of likely practice workloads). This was in preparation to test the construct that each fee band might be assigned a notional annual time allowance based on these average values (see discussion below).

Finally, the average PreViser disease risk scores were analysed for each band for caries and periodontal disease. This was to test the construct that disease risk should be seen to increase through the fee bands from low risk in category A through to significantly higher risk in category E, in an approximately linear manner.

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Results

Figure 1 compares the percentage of patients in each of the five categories (A–E) from the first 10,000 patients assessed in 2013 and the 10,000 patients assessed in 2017. The average oral health score for both groups was 78 (rounded to nearest whole number).

Figure 2 shows the average oral health score (rounded to the nearest whole number) for each of the five fee bands (A–E) in the DEPPA database.

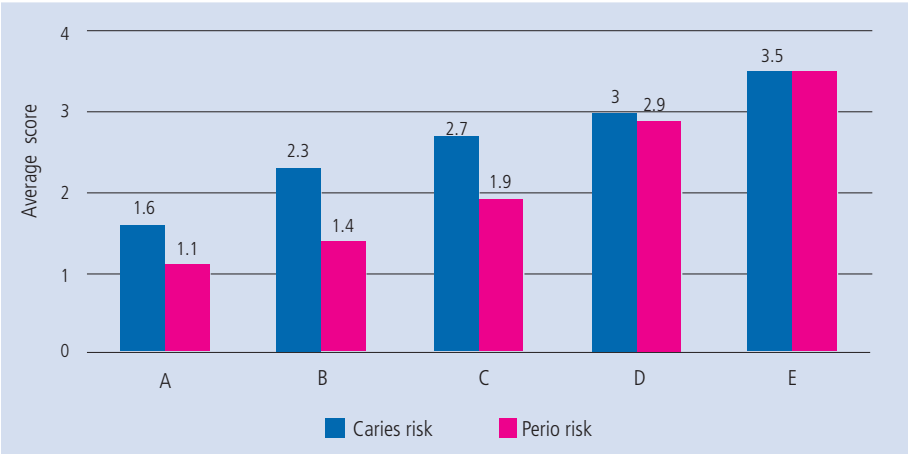
Table 2 shows the average periodontal health, tooth health and patient perception scores (rounded to the nearest whole number) for each fee band (A–E) in the DEPPA data base. Perfect health in each of these aspects is represented by a score of 24.

Figure 3 plots the average PreViser caries and periodontal risk scores for each of the five fee bands (A–E) taken from the DEPPA database.

Table 2 Average periodontal health, tooth health and patient perception scores (rounded to the nearest whole number) for each fee band

Aspect	A	B	C	D	E
Periodontal health	21	17	11	5	3
Tooth health	19	17	16	16	15
Patient perceptions	22	22	21	21	21

Fig. 3 Average PreViser caries and periodontal risk scores for fee bands A-E



Discussion

Capitation fee banding is never likely to be a precise science. However, Figure 1 demonstrates a consistency in the fee code recommendations between the 2013 and 2017 samples. Both groups have the same average oral health score and therefore may be held to be exhibiting similar average oral health status. In fact some individual patients will appear in both samples, as they are in continuing care contracts and it is recommended that full DEPPAs are conducted at least every two years. For the 2013 sample around 200 different dentists contributed assessments to the database; the 2017 sample had about 350 contributing dentists. There would seem to be ongoing consistency as the user group of clinicians grows.

If only repeat patients were re-tested it is possible that the oral health of many patients could have changed significantly between assessments. This may have given the impression of poor reliability but in fact may have been accurately recording oral health change over time. By using two groups with the same average OHS in the test/ re-test samples this is mitigated.

Figure 2 demonstrates a (more or less) linear gradient in average oral health score values from those in the lowest need fee band A (a high OHS average value of 90) through to the highest need band E (a low OHS average value of 63).

Table 2 demonstrates that the most significant contribution to this gradient is clearly periodontal health. The average periodontal health score for each band indicates that whereas many patients in group A will have close to perfect periodontal health many in group E will have severe periodontitis.

A more shallow gradient on tooth health scores demonstrates some increase in the need for the restoration of teeth across the fee bands. However it will be remembered that patients enter these capitation contracts in stable oral health and so this is not so marked. The scores confirm that a typical category A patient has very few existing restorations and rarely needs restorative tooth interventions whereas a typical category E patient much more commonly needs treatment in this respect.

Table 3 Notional annual time allocations for each band suggested by the authors

Fee code	Assessment advice time	Periodontal health	Care time indicated	Tooth health	Care time indicated	Total time indicated
A	30	Healthy	0	Usually healthy	0	30
B	30	Gingivitis	15	Need occasional Intervention	10	55
C	30	Mild periodontal disease	30	Need some interventions	15	75
D	30	Moderate periodontal disease	60	Need some interventions	15	105
E	30	Severe periodontal disease	120	Often need intervention	30	180

Figure 3 demonstrates an increasing future risk of caries and periodontal disease in a gradient through the categories. The risk-based approach to preventive care logically suggests that more preventive resources should be invested in those patients at greater risk of disease. These data demonstrate how the DEPPA fee code guidance appears to be supporting that philosophy.

These data confirm that the most significant workload variation between patients who enter Denplan Care when 'dentally fit' is the differing ongoing need for periodontal care. The DEPPA data permit an estimation of the typical care time needed for patients in each fee band. All

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patients will need a notional time allowance for ongoing assessment. The data in Table 2 allow an estimate to be made for the likely notional periodontal and tooth care needs of each fee band as the average severity of disease for each band is measured. From these notional time allowances, individual practices can calculate their fees taking into account their hourly rates and the skill mix used in the practice. Table 3 presents notional annual time allocations suggested by the authors for illustration purposes only. Ratification of these time allowances could be determined by an expert committee in the event of this protocol being used on a substantive scale. It might also be verified by in-practice time studies.

As the tool was designed to produce these capitation fee banding results from the oral health status and risk scores (see Table 1) it is both expected and reassuring to observe that the outcomes appear to be valid and reliable. Systems such as this may fail to be reliable due to:

1. Poor operator calibration (there are now more than 400 operators)
2. A failure in tool design
3. A failure in the on-line operation of the tool.

Finally, the authors believe that patient assessment tools such as DEPPA facilitate the possibility in the future of extending the range of fee bands to include patients in less stable oral health than currently catered for. This would require the current point weightings to be revised, particularly to accommodate patients needing more restorative interventions.

Conclusions

Reliable capitation fee banding increases the viability and fairness of this funding system, which in turn facilitates a preventive approach for both patients and dental teams. Patient assessment systems such as DEPPA can provide reliable and valid capitation fee code guidance.

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