MIXED METHODS EVALUATION OF THE IMPACT OF CHANGING PROVIDER REMUNERATION ON THE TECHNICAL EFFICIENCY AND QUALITY OF CARE PROVIDED BY NHS GDPS IN NORTHERN IRELAND

- Professor Paul Brocklehurst¹
- Professor Martin Tickle²
- Professor Stephen Birch³
- Professor Ruth McDonald⁴
- Professor Tanya Walsh⁵
- Dr Tom Lloyd Goodwin⁶
- Dr Harry Hill⁷
- Dr Elizabeth Howarth⁸
- Dr Michael Donaldson⁹
- Mr Donncha O’Carolan¹⁰
- Mr Sandy Fitzpatrick¹¹
- Mrs Gillian McCrory¹²
- Ms Carolyn Slee¹³

¹ School of Health Sciences, Bangor University, Bangor, UK
²,⁵,⁶ School of Dentistry, University of Manchester, Manchester, UK
³ Health Services Research & Primary Care, University of Manchester, Manchester, UK
⁴ Manchester Business School, University of Manchester, Manchester, UK
⁷ School of Health and Related Research, University of Sheffield, Sheffield, UK
⁸ Centre for Biostatistics, University of Manchester, Manchester, UK
⁹,¹⁰ Northern Ireland Health and Social Care Board, Belfast, UK
¹¹,¹² Business Services Organisation, Belfast, UK
¹³ Patient and Public representative, Belfast

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Corresponding author details:
PR Brocklehurst, NWORTH Clinical Trials Unit, Y Wern, Bangor University, Holyhead Road, Bangor, LL57 2PZ.

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SCIENTIFIC SUMMARY

Background
Over the last 10-15 years NHS dental services have faced significant criticism, largely about access to care, but also about the lack of responsiveness of the service to inequalities and changing population needs, concerns about the quality of care provided and also the affordability of the service. Since the Steele review of 2009 policy makers across the UK have acknowledged the need to reform NHS dental contracts to address these concerns.

In 2013, our team published a systematic review on the effects of different methods of remuneration on the behaviour of GDPs and concluded that financial incentives influence the clinical activity provided, but a clear understanding of the relationship between a change in remuneration and the impact it has on activity and population health is lacking. The existing evidence from the literature would suggest that GDPs respond very quickly to changes in remuneration to ensure the viability of their practices, which operate for the most part as small businesses. The systematic review recommended that further empirical work was required to improve our understanding of the impact of changes in remuneration on GDPs’ behaviour and patient outcomes.

In 2013, a change in remuneration for NHS dentists was considered by policymakers in Northern Ireland; favouring a system based on capitation rather than the existing Fee-For-Service (FFS) system. The main reasons behind this initiative were to contain costs, promote prevention rather than the treatment of disease, maintain access and improve the quality of care provided. This policy development provided an opportunity to undertake a contemporary evaluation of the impact of a change in remuneration on GDPs’ behaviour and on patients using the service. The Department of Health, Social Services and Public Safety (DHSSPS) in Northern Ireland in conjunction with the Northern Ireland Health and Social Care Board (NIHSCB) made a commitment to pilot a change in the remuneration system and work...
collaboratively with the academic team to undertake a rigorous evaluation of the impact of the pilot.

Objective(s)
The objectives of the research were:

1. To measure changes over the different phases of the study in terms of:
   a. Productivity as measured by the mean quantity of care delivered per provider;
   b. Service mix as measured by the proportions of key indicator treatments, these include: examination plus scale and polish, radiographs, fillings, root canal therapy, crown and bridgework;
   c. GDPs’ time spent delivering patient care;
   d. Cost of care as measured by the volume of care weighted by the standard item treatment costs;
   e. Co-payment revenue;
2. To assess GDPs’ and patients’ views about how, why and to what extent the changes in remuneration affect the delivery and quality of care;
3. To measure changes in patient reported oral health knowledge, attitudes and behaviour; and
4. To measure changes in patient-rated oral health outcomes and quality of care.

Methods
The research programme used a mixed-methods design with three workstreams (WSs).

Workstream One
WS1 used a Difference in Difference (DiD) design to quantitatively measure the change in activity levels across 11 intervention and 18 matched control practices in the three phases of the study each lasting 12 months:
• Phase 1: baseline period prior to the introduction of a capitation-based contract in the intervention practices;
• Phase 2: capitation period for the intervention practices; and
• Phase 3: reversion period, intervention practices returned to FFS.

Intervention practices were selected by a two stage process overseen by NIHSCB. An invitation to participate in the pilot was sent to all practices in Northern Ireland. Practices that submitted an Expression of Interest had to fulfil a set of initial inclusion criteria which would be expected of all participating practices providing NHS dental care. The second stage was undertaken by an internal NIHSCB panel using additional criteria to ensure the final practices selected, exhibited a range of characteristics that could influence activity (practice size, urban versus non-urban and extent of NHS commitment). The total number of practices selected was also influenced by affordability; the NIHSCB had a fixed budget for the pilot and had to ensure it could accommodate the possible fall in patient change revenue.

The control group of practices was selected using a two-stage process with oversampling. Initially, stratified random sampling was used to identify potential control practices using the following strata: practice list size, proportion of children registered, proportion of adult patients exempt from patient charges and geographic location. This initial process identified 45 potential control practices, 15 of which could not be used because of data inconsistencies, leaving 30 potential control practices. The final stage of selecting control practices involved matching the 11 intervention practices to control practices using a propensity score approach, which identified 18 matched control practices.

Three broad sets of outcome measures were used to assess the impact of the change in remuneration on:
1. **Access**: Different types of registration as a proportion of the total number of patients on the practice list was used to measure the impact on access;

2. **Service mix**:  
   a. Complex treatments requiring extensive clinical time or work completed by a dental laboratory;
   b. Treatment of disease e.g. direct restorations (fillings) and extractions;
   c. Preventive care e.g. examinations and fissure sealants;
   d. Composite measures of activity (number of treatment items and number of items per treatment plan); and

3. **Financial outcomes** (total health service income and patient charge revenue).

All intervention and control practices were required to submit HS45 payment claim forms to the Business Services Organisation which enabled identification of all NHS treatments provided during each phase of the study. Analyses were performed at the practice level. We also used the same DiD approach to compare the behaviours of equity-owning Practice Principals (PPs) and non-equity owning Associate Dentists (ADs).

Triangulation of the DiD results was performed using an Interrupted Time Series (ITS) approach, on selected outcomes. A linear model was fitted for each outcome over time, for each of the three phases of the study. Discontinuities (‘jumps’) were allowed at each transition point to represent any sudden change in outcome. Intervention effects were measured by the difference in jump between the control and intervention groups at the transitions between each phase of the study.

**Workstream Two**

WS2 used qualitative methods to assess GDPs' and patients' views about the changes in remuneration and its impact on care delivery. Purposive sampling was used to recruit GDPs and patients from intervention practices. GDPs were identified by the NIHSCB and PP and ADs from each participating practice were recruited. GDPs from intervention practices

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identified patients for interview. Interviews were conducted face-to-face with 11 PPs and by telephone with seven ADs and 14 patients. All interviews were recorded and transcribed verbatim with collection and analysis running concurrently. A thematic analysis of individual transcripts was undertaken. Transcripts were systematically coded and catalogued and the results recorded using NVivo software.

**Workstream Three**

In WS3, we used a questionnaire to capture any patient-reported changes in the care provided. The questionnaires were developed with our PPI group. Questionnaires were distributed to patients registered with practices in both intervention and control practices at each study phase.

Five matched control practices from all NHS dental practices in Northern Ireland were selected for each intervention practice. Practices were matched on: practice size, proportion of patients exempt from fees, proportion of adult patients and rural/urban status. A quota sampling approach used three domains to stratify the sample: exemption from NHS charges, gender and age. A total of 9,000 questionnaires (3,000 in each phase of the study, 4,500 to patients in both intervention and control practices) were sent out in waves of 250. The first wave of questionnaires were sent to an equal number of patients from each strata. Subsequent waves were targeted, with greater proportions distributed to strata with low response rates. DiD models were estimated using patient responses to each question in the questionnaire.

**Results**

**Workstream One**

No statistically significant difference was found between intervention and control practices during the baseline period, when comparing mean number of examinations, Multiple Deprivation scores, gender of patients, patients exempt from fee-paying and age. The DiD analyses identified significant and rapid changes in behaviour in the intervention group of practices at each transition period, FFS to capitation and capitation back to FFS, compared to the control practices.
Access: In the lead up to the change from FFS to the capitation-based payment period, the observed changes appear to suggest that intervention practices met their specified target to avoid contractual penalties. During the capitation period there was a small (1.5 registrations per month per 1,000 registered patients at baseline), when compared to the control practices, but a significant relative increase in registrations in the intervention practices. This increase was primarily due to a relative reduction (27.1 registrations per month per 1,000 registered patients at baseline) in lapsed registrations in the intervention group.

Service-Mix: The change from FFS to capitation saw activity depressed ‘across the board’, with all individual treatments and composite measures of activity (except treatments with a gross cost of £280 or more) showing statistically significant reductions compared to the control practices. There was no evidence of ‘cherry picking’ treatments that were more profitable to provide. The difference in the difference (between intervention and control practices) in the mean number of items of treatment per 1,000 registrations increased significantly (p<0.05) by 174.8 items between baseline and the capitation period, compared to control practices. This difference was caused by a reduction of activity in intervention practices. There was a rapid return to baseline levels of activity on reversion from capitation to FFS for all variables, with no corresponding increase in activity among control practices.

Differences in activity were seen between PPs and ADs. ADs were more sensitive to the intervention, registering significant changes for all activity outcomes with larger effect sizes than those of PPs. In response to the change from FFS to capitation PPs did not show a significant change in activity for indirect restorations, fissure sealants and treatment plans provided per month. There was a persistent change in behaviour among PPs for some items of treatment; there was a statistically significant increase in the number of extractions delivered in the FFS reversion period when compared to FFS at baseline, the number of radiographs and root canal treatments after a fall under capitation did not return to baseline levels when reverting to FFS.

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Finance: The fall in activity during the capitation period significantly reduced overall notional practice income by £5,920 per month in intervention practices as compared to control practices, with notional income measured by what income a practice’s activity would have accrued from the NHS if those practices had been paid under FFS. There was no change in the proportion of practice income derived from patient charges between phases of the study as compared to control practices. However, the fall in activity in the intervention practices compared to control practices resulted in a significant (p<0.05) difference between intervention and control practices in patient fee contributions per month by £2,403. Patient charge revenue rapidly reverted to baseline levels in the FFS reversion period with no corresponding increase in control practices.

Triangulation of the DiD results using ITS analyses showed the same direction of effect (and statistical significance) across the selected outcomes (bar one).

Workstream Two
Compared to the DiD, the interviews with GDPs revealed a more nuanced picture. Different behaviours were evident across the intervention practices and these appeared to be influenced by the variance in organisational structures and views across the intervention practices. Variation appeared to result from individualised approaches to managing the tension between professional ethics and the need to run a profitable business. Local context also contributed to variation, the behaviour of GDPs was influenced by relationships with peers, their community and their individual patients and accountability that comes with serving small communities. The capitation model was preferred by PPs as it was seen to provide more time for managing the activities of the practice and provided greater opportunities for private treatment and increasing total practice income. NHS capitation payments introduced a sense of value to the provision of NHS care amongst PPs; the capitation payment being seen by some PPs as a ‘retainer fee’ for keeping their doors open to NHS patients. ADs were less keen on the capitation model and perceived themselves to be at
financial risk, as their contracts would be held by their PPs and not through a direct contract with the NIHSCB. Whilst GDPs can be acutely sensitive to incentives within dental contracts, the subtle contextual variations and their associated causal mechanisms would suggest that not all GDPs behave in the same way when their remuneration is altered.

The interviews with patients were less revealing, there were high levels of satisfaction and trust with their GDPs and none of the patients interviewed noticed a change in the service as a result in the change to the payment system.

Workstream Three
There were no significant differences in patient-reported oral health knowledge, attitudes and behaviour in the questionnaire designed by patients (compared to the control practices). Only three items on the questionnaire relating to quality of care showed a statistically significant difference between the intervention practices and controls. Patients in intervention practices felt they: had to wait longer for an NHS check-up; were less likely to have a radiograph taken; and more likely to have been treated by a Dental Hygienist.

Conclusions
Compared to GDPs in control practices who continued to be paid by FFS throughout the period of study, there was a rapid and clinically significant fall in the quantity of care delivered following the transition from FFS to a capitation-based remuneration. An equally rapid reversion of activity back to baseline levels was seen in the return from capitation back to FFS. However, the behaviour of ADs was more sensitive to the change in NHS remuneration when compared to PPs.

Interviews with GDPs revealed a more nuanced picture, with the variation across the practices resulting from different approaches to managing the tension between professional ethics and the need to run a profitable business. Local context also contributed to variation, the behaviour of GDPs was influenced by relationships with peers and their individual patients and © Queen’s Printer and Controller of HMSO 2019. This work was produced by Brocklehurst et al. under the terms of a commissioning contract issued by the Secretary of State for Health and Social Care. This ‘first look’ scientific summary may be freely reproduced for the purposes of private research and study and extracts may be included in professional journals provided that suitable acknowledgement is made and the reproduction is not associated with any form of advertising.

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accountability that comes with serving small communities. Patients reported little change as a result of the change in payment mechanism.

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