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Complete List of Authors:	Close, James; University of Plymouth, Community and Primary Care research group Fosh, Ben ; University of Plymouth, Community and Primary Care Research Group Wheat, Hannah; University of Exeter, Sociology, Philosophy and Anthropology department Horrell, Jane; University of Plymouth, Community and Primary Care Research Group Lee, William; University of Plymouth, Community and Primary Care research group Byng, Richard; University of Plymouth, Peninsula Schools of Medicine and Dentistry Bainbridge, Michael ; NHS Somerset Clinical Commissioning Group Blackwell, Richard; South West Academic Health Science Network Witts, Louise; South West Academic Health Science Network Hall, Louise; South West Academic Health Science Network Lloyd, Helen; University of Plymouth, Psychology
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A Longitudinal Evaluation of a Countywide Alternative to the Quality Outcomes Framework in UK General Practice, Aimed at Improving Person Centred Coordinated Care.

Close, James james.close@plymouth.ac.uk

Corresponding author.

University of Plymouth, Community and Primary Care research group
ITTC Building
Davy Road, Plymouth Science Park
Derriford, Plymouth
Plymouth, UK PL6 8BX
01752 764260

Fosh, Ben Ben.fosh@plymouth.ac.uk

Wheat, Hannah H.Wheat@exeter.ac.uk

Horrell, Jane jane.horrell@plymouth.ac.uk

Lee, William william.lee@plymouth.ac.uk

Byng, Richard richard.byng@plymouth.ac.uk

Bainbridge, Michael Michael.Bainbridge@somersetccg.nhs.uk

Blackwell, Richard Richard.Blackwell@swahsn.com

Witts, Louise Louise.Witts@swahsn.com

Hall, Louise Louise.Hall@swahsn.com

Lloyd, Helen helen.lloyd-1@plymouth.ac.uk

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Evaluation of a Countywide Alternative to the Quality Outcomes Framework, Aimed at Improving Person Centred Coordinated Care.

Abstract

Objectives.

To evaluate a county-wide deincentivisation of the Quality Outcomes Framework (QOF) payment scheme for UK General Practice (GP).

Setting

In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups. Fifty-five GP practices in Somerset established the Somerset Quality Practice Scheme (SPQS) – a de-incentivisation of QOF – with the goal of redirecting resources towards Person Centred Coordinated Care (P3C), especially for those with Long Term Conditions (LTCs). We evaluated the impact on care from April 2016 to March 2017.

Participants & Design

The evaluation used matched data from 55 SPQS practices and 17 regional control practices for three survey instruments. We collected patient experiences ('P3C-EQ'; 2363 returns from patients with 1+ LTC; 36% response rate), staff experiences ('P3C-practitioner'; 127 professionals), and organisational data ('P3C-OCT'; 36 of 55 practices at two time points, 65% response rate; 17 control practices). Hospital Episode Statistics emergency admission data were analysed for 2014-2017 for ambulatory-sensitive conditions across Somerset using interrupted time series.

Results

Discretion from QOF resulted in time savings in the majority of practices. Practice data showed a significant increase in P3C oriented organisational processes, with a moderate effect size (Wilcoxon signed rank test; p=0.01; r=0.42). Care delivery was altered via stronger federation-level agreements and informal networks, increased multidisciplinary working, reallocation of resources for other health care professionals and changes to the structure and timings of GP appointments. Patient and practitioner experiences were similar in SPQS versus control practices. No disbenefits were detected in admissions data.

Conclusions

The SPQS scheme leveraged time savings and reduced administrative burden via discretionary removal of QOF, enabling practices to engage actively in a number of schemes aimed at improving care for people with LTCs. We found no differences in the experiences of patients or healthcare professionals between SPQS and control practices.

Article Summary

Strengths and limitations of this study

- This study evaluated changes to service delivery, conducted using two survey tools – offering a perspective on the experiences of both patients and healthcare professionals.
- These were supplemented with a longitudinal analysis of organisational change (to measure alterations to service deliver) and a time-series of emergency admissions for ambulatory-sensitive conditions (to detect disbenefits arising from the scheme).
- Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region.
- No detectable improvements were established in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, or changes to patient/practitioner experiences were somewhat distal to the intervention.

Main Text

BACKGROUND

The Quality Outcomes Framework (QOF) for UK General Practice (GP) is one of the largest health-related pay-for-performance (P4P) schemes in the world[1]. Following implementation in 2004, the scheme initially had a positive impact on quality of care, primarily achieved via establishment of consistent procedural baselines in the clinical management of incentivised (mostly chronic) diseases[1–5]. It reduced between-practice inequalities in care delivery[1–3] whilst also leading to improved disease registers, widespread recording of clinical activities and adoption of electronic medical record systems[1], leading to growth in GP data and related research[6,7].

Since the introduction of QOF, demographic shifts of an ageing population have continued to drive a shifting clinical landscape[8], with the number of people with three or more long-term conditions (mLTCs) thought to have risen by one million over the last decade[9]. The subsequent rising demand for the management of LTCs and mLTCs – requiring tailored and coordinated support[10,11] – has led to QOF (with its emphasis on processes for single disease guidelines) being viewed as increasingly anachronistic[6,12–16]. After introduction of QOF, there was a significant reduction in the continuity of care[2,17] and the person-centeredness of GP consultations[13,14,18,19], with a subsequent decline in patients' satisfaction[20]. It has been argued that QOF does not incentivise appropriate clinical care for people with multimorbidity[6,12–16], who require individualised support, greater continuity of care and a holistic, biopsychosocial approach that is responsive and empowering[10,11]. An oft-quoted criticism is that QOF reduces consultations to 'box-ticking' exercise[21].

In response to such criticisms, both the NHS Chief Executive and the General Practitioners Committee (GPC) Chairman have backed the removal of QOF[21]. In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups (CCGs), allowing organisations the freedom to develop alternatives. Potential advantages included the targeting of local health

needs and greater clinical engagement for quality improvement[22]. The Somerset Practice Quality Scheme (SPQS) was established in the same years as a de-incentivisation of QOF. It arose because GPs, the Clinical Commissioning Group (CCG) and the Local Medical Committee (LMC) felt that QOF was not incentivising the highest value clinical behaviour. The goals were to allow clinicians the freedom to innovate, enable consultations to be more person-centred and increase involvement with a number of concurrent schemes aimed at improving Person Centred Coordinated Care (P3C)[23]. The details of the scheme were included in the SPQS contract[24] and local Sustainability and Transformation Plan (STPs – Plans for reforming healthcare mandated by the Five Year Forward View[25]) of the GPs[26]. (See Supplementary File 1 for a summary of Somerset STPSs; box 1 for brief details of the various schemes and references for details). The contract removed incentives from QOF, although CQRS (Calculating Quality Reporting System) remains active in order to collect prevalence data for payment calculations. The STPs detailed how the reduced QOF overhead would be exploited, with SPQS implemented via a number of initiatives, including involvement in related schemes such as Symphony Vanguard[27], Village Agents[28] and Health Connections Mendip (HCM)[29]. Fifty five Somerset practices opted for SPQS, with 18 Somerset practices (initially 20) retaining the existing QOF contract. (The SPQS practices increased to 57 in 2015/16; but two mergers reduced it back to 55).

Test & Learn: Comprises three similar initiatives (South Somerset, Taunton and Mendip – see below), which share a common goal of targeting complex, multimorbid patients with a suite of approaches including single personalised care plans, multi-disciplinary team (MDT) input and single point of access to provide person centred coordinated care (P3C).

Test & Learn – South Somerset Vanguard: A symphony hub system located at Yeovil District Hospital, with complex patients remaining under management of GP practice, but receiving extra support from Health Coaches/Key Workers at the Symphony service.

Enhanced Primary Care (EPC): EPC is a sub-component of the Symphony vanguard scheme that incorporates health coaches (HCs) into primary care, focusing on less complex patients, allowing GPs to focus primarily on medical problems.

Test & Learn – Taunton: Operates under a "virtual hub" model, with complex/frail patients managed by a multidisciplinary team with shared care plans and Wellbeing Advisors.

Test & Learn – Frome Mendip, including "Health Connections Mendip". With loose eligibility criteria and a number of referral routes, Community Practice Nurse and Health Connectors (based at Frome) liaise regularly in MDT meetings. There is a hub telephone line for single point of access. The model advocates utilising existing assets in the community. The Health Connections team lead social prescribing work with a service directory to signpost patients to appropriate resources.

Village Agents Service: Supports isolated, excluded and vulnerable (including elderly and multimorbid) people by offering a signposting and referral service. The service links with general practices.

Living Better: A working partnership between the GP practices in the pilot, AGE UK Somerset, Social Care, Somerset Partnership, West Somerset District Council, and Somerset Clinical Commissioning Group. The project supports people with one or more long-term conditions to better self- manage, reconnection their lives to the community and reducing dependency on health and social care.

Box 1. Initiative for implementation of SPQS, as discussed in Supplementary File 1.

The initial phase of the scheme was previously evaluated with a retrospective approach[30]. This revealed early stages of organisational change. There was a genuine passion and commitment to improving P3C, including stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources towards health care assistants, nurses and others, and changes to structure and timings of appointments with GPs. From April 2016 to March 2017 we conducted a longitudinal evaluation of the second full year of the SPQS programme (see Supplementary File 2 for a timeline of the SPQS scheme and associated evaluations). This was commissioned with the aims of establishing the nature and extent of P3C that has been

implemented since discretion from QOF, explore staff and patient experiences of care delivery and examine non-elective hospital admissions before and after inception of the scheme.

METHODS

We conducted a mixed-methods evaluation of SPQS which included a suite of quantitative and qualitative tools. Analysis of quantitative data is described in this paper. In-depth qualitative findings will be published in a subsequent paper (including semi-structured interviews with practitioners; observations of consultations and facilitation workshops with practices). A schematic overview of the full SPQS evaluation framework is provided in figure 1. The quantitative evaluation included completion of survey tools targeting patient experiences (P3C-EQ), staff experiences (P3C-practitioner) and organisational perspectives (P3C-OCT tool), alongside time series of Hospital Episode Statistics (HES) for ambulatory-sensitive conditions across Somerset. We chose not to use national measures of General Practice (i.e. GP Patient Survey (GPPS) and Friends and Family Test (FFT)): they have a broad sample and do not target the patient group (i.e. patients with LTCs) that are the focus of SPQS. Furthermore, they do not target the construct of interest (i.e. P3C).

<figure 1 here>

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Samples

The 55 participating Somerset practices (mean list size = 7,695; median = 6515.5; smallest = 1834; largest = 29,078) completed our evaluation tools (see below). Whilst these 55 practices were incentivised to take part in our evaluation (i.e. by being part of SPQS), the non-SPQS Somerset practices had no incentive to act as controls and did not participate in this study. Therefore, for control practices, we initially identified a cohort of non-Somerset control practices matched for staffing data, list size, population density, indices of multiple deprivation, QOF scores and disease prevalence. However, the incentives available for this evaluation (£200 per practice) were only sufficient to recruit six practices by this method. We therefore supplemented this group with 11 unmatched practices from across the Southwest, making a total of 17 control practices (mean list size = 6,714; median = 4878; smallest =2678; largest = 4878). The control group therefore represents a self-selected sample of practices that are likely to represent engaged, active practices (i.e. with the resources to engage with research). In contrast, completion of our evaluation was mandatory for all SPQS practices.

Patient and Public Involvement

Patients were involved via the peninsula CLAHRC patient involvement group (PenPig), who set priorities for research objectives. Patients, public and healthcare professionals were also involved in co-design workshops to develop the measurement framework and individual questionnaires (see papers for details [23,31–36]). Patients also reviewed drafts of ethics approval applications and all patient-facing communication. The work was co-presented with patients at the South West Society for Academic Primary Care Regional Meeting 2018.

Survey Tools

The P3C-Patient Experience Questionnaire (P3C-EQ) is a brief, 11-item patient-completed measure of patient experiences of person centred coordinated care delivery, which we have previously validated[31,37,38]. The tool can be used to generate an aggregate score of patient experience[31], or be sub-scored to previously described sub-domains of P3C[23,31,33–36]. From each practice, 100 patients with one or more LTCs, randomly sampled from the practice list, were invited to complete a postal questionnaire at a single time point.

The P3C-Practioner Experience Survey is a 29-item instrument that measures individual and managerial experience of delivering person centred and coordinated care. Via a workshop with healthcare professionals, we selected the previously validated P3C-Practitioner questionnaire (also known as the Person-Centred Health Care for Older Adults Survey[39]) as the most suitable instrument to examine practitioners' perspectives of P3C (see Supplementary File 3). A minimum of two practitioners from each practice were requested to respond.

The P3C-Organisational Change Tool (P3C-OCT) is an evidenced-based measure of progress towards delivering person centred coordinated care from an organisational perspective[39]. It was developed to support and measure P3C in line with Year of Care[34] and RCGP principles of Collaborative Care and Support Planning[40], thus providing a way to monitor changes in line with policy directives which improve P3C. The tool was designed to measure all core P3C routines which have been identified through research[41,42], patients' accounts, policy documents[34] and our own work[23,39]. The design of the P3C-OCT is based on a shared consensus of the components of person-centred coordinated care (e.g. [34,35,43]), which broadly correspond to five domains: Information and Communication; Care Planning; Goals and Outcomes; Transitions; Organisational Process Activities; and Decision Making. These domains have been mapped to real-world actions that support the delivery of P3C (e.g. multi-disciplinary team meetings, care planning, provisions for information etc.) This allows the tool to translate concepts which are often abstract, and may be drawn from academic literature and policy documents, into actionable, tangible processes which a practice can implement. The result is a unique 29-question instrument with over 500 different possible responses, which provides a detailed and practical interrogation of P3C delivery. An equally-weighted scoring system allows results of the P3C-OCT to be aggregated into a single composite score, or alternatively by sub-domains of P3C.

Offered as an electronic or paper version, we requested that the tool was completed by a combination of General Practitioner and Practice Manager (PM), thus ensuring representation of front-facing and backend operations of GP surgeries. The P3C-OCT provides a detailed profile of care delivery and organisation through 29 core questions. All questions ask about objective activities (e.g. processes in place to deliver P3C) and subjective responses (e.g. how well these are working). Scores are given out of a theoretical maximum of 20 points. The P3C-OCT was also prepended by a series of SPQS-related questions about administrative and consultation time savings from discretion from QOF. Each SPQS practice was requested to complete the P3C-OCT at two time points (from Feb-Aug 2016 and Dec 2016-Mar 2017). In contrast, control practices only completed the P3C-OCT once (at Time 2).

Analysis

SPQS and control practices were compared on the P3C-Patient Experience survey and the P3C-Practioner Experience Survey (at time 2; 6-12 months after initiation of second year/phase 2 of SPQS), with significance tested using the non-parametric unmatched Mann–Whitney–Wilcoxon (MWW) test taking into account within-practice clustering by calculating Somers' D statistic (non-parametric tests were used as the scoring is a summation of Likert responses i.e. data was ordinal). For the P3C-Organisational Change Tool, we compared Time 1 (immediately after implementation of second year/phase 2 of SPQS) and Time 2 (6-12 months later), with significance evaluated by Wilcoxon signed rank test.

Time Series of emergency admissions to hospital

A multi-group interrupted time-series analysis (ITS) was conducted to identify whether de-incentivisation of QOF and the introduction of SPQS was associated with changes in emergency admissions to acute hospitals with a primary diagnoses for four long-term, ambulatory care sensitive conditions (ACSCs). Hospital episode statistics (HES) were obtained for patients from all 55 GP practices enrolled in the SPQS scheme (actually 56 practices in 2015/15) and 18 Somerset QOF practices (i.e. Somerset practices not enrolled in SPQS; initially 20). Data was obtained for a 70 month period from April 2011 to May 2018. This time period is divided into 38 months pre-intervention (Apr 2011 – May 2014) and 48 months post intervention (June 2014 – May 2018; SPQS contract went live in June 2014, month 39). Data include monthly admission counts for four ACSCs: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes, and Stroke. We selected these ACSCs as a proxy for preventable admissions and an indicator of any deteriorating quality of care associated with SPSS. Due to the difference in number of practices between SPQS and QOF practices, admissions were divided by the number of practices, thus providing an average of emergency admissions (expressed as admissions per month per practice). Analysis was performed using the *itsa* command[44] on STATA (StataCorp Ltd). This uses regression-based model with Newey-West standard errors. Pre- and post-intervention slopes/intercepts of the sample (SPQS practices) were compared to controls (QOF practices). Lag period was set to 1 month.

RESULTS

P3C-EQ

There were 1,752 responses received from 49 (89%) of the 55 practices enrolled in SPQS, and 611 responses from patients enrolled in the 17 control (QOF) practices (36% response rate and similar to other similar other studies[45]). The two groups of responses are compared in Table 1.

Table 1: Demographic profile of responses to P3C-EQ as percentages.

Participant demographics as a percentage											
Age			**Education**			**Gender**			**Multi-morbidity**		
	QOF	SPQS		QOF	SPQS		QOF	SPQS	**No. LTCs**	QOF	SPQS
<=24	0.3	0.4	None	1.0	1.3	Male	44.0	43.4	1	19.6	20.1
25-34	2.5	1.3	Primary	3.1	2.1	Female	53.8	53.9	2	19.6	23.8
35-44	2.5	2.6	Secondary	33.7	34.6	Non-response	2.2	2.7	3	20.6	17.8
45-54	8.8	5.3	College	26.4	28.1				4	11.3	13.7
55-64	18.3	13.3	Undergraduate	11.5	10.8				5	9.3	7.5
65-74	25.7	29.2	Postgraduate	8.2	7.8				6	4.7	5.1
75-84	29.3	32.7	Non-response	16.2	15.3				7	2.8	2.8
>=85	12.1	14.1							>=8	4.2	2.8
Non-response	0.5	1.0							Non-response	7.9	6.4

The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1,752) and QOF controls (23.68, n. 611) were not significantly different (MWW U test; *p=0.346*).

P3C-Practitioner results

Full results of the P3C-Practioner are provided in Supplementary File 3. We received 98 responses from 55 SPQS practices and 29 responses from 18 control practices from a mix of healthcare professionals – 62 GPs (49%); 35 Nurses (27%); 12 Wellbeing Advisors; 7 LTC nurse; 11 others. The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1752) and QOF controls (23.68, n. 611) were not significantly different (MWW test; *p=0.405*). Return rates are not applicable, as this was a convenience sample where we requested response from at least two different professionals at each practice.

P3C-OCT Results

To evaluate changes to P3C during the SPQS scheme we undertook an analysis of the organisation and delivery of care using the P3C-OCT. Of 55 practices enrolled in the scheme, 36 practices provided admissible data at the two evaluation time-points (Time 1: 2/2016–8/2016 and Time 2 was 12/2016-5/2017; 65% response rate). This revealed an increase (0.9; *p*=0.034) in aggregate scores on the P3C-OCT between T1 (5.8) to T2 (6.7). This therefore represents a measurable increase in activity towards person centred coordinated care delivery and organisation (see table 2), with a moderate effect size (*r*=0.42). To determine the specific areas of person centred coordinated care (P3C) that improved during the evaluation, this was examined by domains of P3C[34–36]. When broken into subdomains of P3C, significant improvements were delivered in areas related to 'Goals and Outcomes' (e.g. goal setting with patients; 1.7 increase, *p*=0.00; large effect size *r*=0.61) and

'Organisational Process Activities' and "Organisational Process Activities" (0.9 increase, *p=0.*03; *r*=0.3)

Table 2: Mean changes in P3C-OCT scores between time 1 and time 2 for 36 paired practices. The top row provides the total OCT score (out of a maximum of 20), followed by domains of P3C. The OCT score for each domain is given for time 1, time 2 and the difference between time 1 and 2. The statistical significant of these differences is indicated by *p-value* from Wilcoxon signed rank test. Statistically significant results (at the level p<0.05) are indicated in bold font and with an asterisk next to the *p*-value. Effect sizes were calculated as test statistic *z* by the square root of the number of pairs.

	Time 1	**Time 2**	**Change T1→ T2 (p-value; effect size)**
Total OCT Score:	**5.8**	**6.7**	**0.9 (*p*=0.01; *r*=0.42)***
Information & Communication	7.4	8.1	0.7 (*p*=0.25; *r* =0.19)
Care Planning	6.6	7.2	0.6 (*p*=0.14; *r*=0.25)
Goals & Outcomes	6.1	7.8	**1.7 (*p*=0.00; *r*=0.61)***
Transitions	4.9	5.2	0.3 (*p*=0.43;*r*=013)
Organisational Process Activities	4.3	5.2	**0.9 (*p*=0.03;*r*=0.36)***
Decision Making	3.8	4.4	0.6 (*p*=0.07;*r*=0.3)

Further to the longitudinal analysis, SPQS practices were also compared to a cohort of 17 non-SPQS practices from the South West (all control practices returned data at Time 2). Aggregate results for the P3C-OCT revealed that control practices had an aggregate score of 6.2 on the P3C-OCT. This suggests that SPQS practices were underperforming against the control group at time 1 (e.g. a score of 5.8 versus 6.2; *p=0.64*), whereas later in the evaluation, at time-point 2, this situation had been reversed (6.7 versus 6.2; *p=0.41*) – although these are both non-significant.

Discretion from QOF and time savings

When asking SPQS practices to complete the P3C-OCT, we also included a number of additional questions related to the SPQS scheme. We asked SPQS practices a subjective appraisal of time savings (both in GP consultations and administration) from enrolment in the scheme. These are shown in figure 2. More than half (55%) of the practices (28 of 51 practices that completed these questions) agreed that time had been freed up within the 10 minute standard consultation time. Flexibility in consultations is a prerequisite for person-centred consultations for those with complex

health needs. A free text response box (following the above 3 questions) illuminated how time savings were utilised. Whilst qualitative analysis is beyond the scope of this paper, these comments reiterated the SPTs, e.g. “the conversation has changed, and consultations take a very different path”, including more personalised care planning with “using their own clinical judgement, which is more patient-focused/led, rather than a tick-box”. These opinions were reiterated: “a more holistic consultation geared to the individual patient's needs and situation.” These findings were confirmed from non-SPQS (QOF) practices, who stated that “QOF collecting data can often take time away from dealing with more important aspects of patient needs”. Finally, the alterations have allowed more flexibility in GP appointments, where the removal of QOF incentivisation also enabled greater flexibility for practice-management, where “the 10 minute appointment system in primary care imposes great restraints”.

<figure 2 here>

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

With regard to administrative time savings, more than three quarters of SPQS practices (40/51; 78 %) reported administrative (non-consultation time for practitioners) time savings since initiation of the scheme, with just over one third of these practices (14/51; 27%) reporting gains of more than 2 hours per week. For administrators and non-clinical staff, SPQS was reported to free up time for more than 86% (44/51) of practices with only 13 % (7/51) reporting a negligible effect. Again, the free text response boxes confirmed the plans of the STPs (see introduction and Supplementary File 1), stating that efficiency had been leveraged for increased collaborative and federation-level working, including engagement with a number of schemes in Somerset designed to improve person centred and coordinated care e.g. “Better use of Symphony”, “Engagement with EPC”, “Rural Practice Network”, “Health coaches”, “Huddles”, “P3C relevant training”, “Replaced by other work such as Symphony/health coaching etc”, “This hasn't shown a reduction in workload but rather a change in workload.”

Retention of QOF elements

When asking SPQS practices to complete the P3C-OCT, we also included a number questions specific to the implementation of SPQS. When asked ‘Are you still using components of the QOF?’, nearly all practices enrolled in SPQS continued to use at least some aspects of QOF (only 1 out of 51 respondents to this question stated “none”; 86% of practices used “Some”, “Most” or “All”). We further investigated the continued utilisation of QOF via a free-text response in the P3C-OCT questionnaire. This revealed that QOF was still (according to one practice) utilised by “applying individually, not 'point scoring’”. A common aspect that was dropped was exception reporting, with time also being saved by avoiding “target chasing”. Elements of QOF were also contractually retained such as the CQRS (Calculating Quality Reporting System). This remained active under the SPQS contract to allow data on prevalence and key indicators to be collected from practices via GPES (GP Extraction System), where prevalence figures are utilised in the SPQS payments calculation.

QOF also continued to be utilised for the monitoring of LTCs and recall of patients with LTCs for routine check-ups. Around a half of SPQS practices (n. 25) still use QOF for recall of at least some (or

all) conditions (e.g. checking for recall requirements for patients with LTCs and the management of specific chronic diseases). Free text responses suggested that whilst recall was an essential function, the implementation under QOF was overly burdensome and not tailored for multiple morbidities. Some practices countered this by running in-house developed searches with a priority to "concentrate on an integrated LTC system". This suggests that that there is scope for collaboration to design an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs (as previously proposed[46,47]).

Time Series of Hospital Episode Statistics

Results of the interrupted time series (ITS) are shown in figure 3. No significant increases were detected in the slope post-intervention (i.e. after the initiation of the SPQS contract in June 2014) in emergency admissions for patients with a primary diagnosis of four ACSCs in SPQS practices. Full results of significance tests are provided in Supplementary File 4. The removal of QOF has had no significant effect on emergency admissions for these four ACSCs at the time of intervention, or in the two years following. However, for the non-SPQS Somerset practices, a significant slope change (increase) in admissions for AMI and Diabetes were observed, and a significant slope change (decrease) for admissions for Stroke was observed. These changes in admissions are therefore unrelated to the SPQS contract (see discussion below).

<figure 3 here>

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see supplementary data).

DISCUSSION

We observed a variety of responses to de-incentivisation of QOF in Somerset. Some QOF-related components remained mandatory (prevalence reporting). Some 'desirable' features of the QOF system were still used (e.g. prompts during consultation), others were adapted (e.g. patient recall) and some burdensome components dropped altogether (e.g. exception reporting).

Practices reported that these alterations had led to time and resource savings in both GP consultations and administration. These time savings were used to increase involvement in implementation projects such as Symphony Test and Learn, Village Agents, Health connections, and the South Somerset Vanguard. These were planned as part of the SPQS contract and associated ongoing healthcare reform. These local implementation projects are actively targeting service redesign for complex patient needs, using person centred coordinated care across practice contexts. These projects have involved stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources for health care assistants

(including Health and Wellbeing Advisors and Health Coaches), nurses and others, single points of access for the patient, shared electronic record systems, increased use of care planning and changes to structure and timings of GP appointments. The results of our longitudinal P3C-OCT survey confirm significant improvements in P3C, suggesting that SPQS has been successful in its stated aims as a system lever for service redesign aimed at the delivery of greater person centred and coordinated primary care.

Whilst there is emerging evidence that P3C approaches can improve outcomes (particularly for complexity/multimorbidity)[35,48], we could not establish that the changes introduced via SPQS are leading to better outcomes for patients. Patient experience is downstream of the organisational changes occurring in Somerset, and any detectable improvement in patient outcomes may be delayed. The results of the patient P3C-EQ experience established a similar experience of care in Somerset compared to the control QOF practices (who represent active, research engaged-organisations, whereas completion of the survey was mandatory for SPQS practices; see methods). Similarly, comparison of practitioner perspective of P3C to the control group revealed similar experiences in SPQS versus the control practices.

Whilst this evaluation did not assess costs on healthcare (data permissions not provided by NHS Digital), a recent US-based review found large (albeit not statistically significant) average healthcare savings with interventions that have parallels to the models being deployed in Somerset (e.g. community health workers/coaches and improved use of health information technology[49]).

In reference to disbenefits, we could find no evidence of increased admissions associated with SPQS. However, ITS did establish trend changes in admissions in non-SPQS Somerset practices (e.g. those practices that retained the QOF contract). A significant increase was observed in admissions with a primary diagnosis of AMI and Diabetes, and a significant decrease observed for those with a primary diagnosis of Stroke. It is, however, unlikely that relatively minor changes to QOF in the years 2014/15 and 2015/16 [50,51] have led to these observed trend changes in emergency admission.

Whilst the time series did not establish any disbenefits in SPQS practices, earlier evaluation of SPQS established that deincentivisation of QOF leads to inconsistent recording of QOF data. Subsequently, analysis of QOF scores have little utility in assessing the quality of care in Somerset[30]. This paucity of data represents a major disbenefit of QOF deincentivisation: one of the primary benefits of QOF has been the widespread recording of clinical activities[1] and availability of GP data and research[6,7]. It is not currently clear how 'quality' could be assessed in the post-QOF landscape – a question that has major implications for research, evaluation, healthcare management.

Limitation of the study

The ability to draw firm conclusions from this study were limited by several factors. Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region. These represented a biased cohort of research-engaged practices. We could not detect improvements in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, the controls were unsuitable, or changes to patient/practitioner experiences were somewhat distal to the intervention.

Implications for the future

With both the NHS Chief Executive and the GPC Chairman backing the phased removal of QOF[52], these lessons from SPQS have implications for UK policy. We have previously made a number of suggestions for the post-QOF landscape.[46,47] These include retaining limited components of QOF (e.g. those elements that are desirable by GPs; "QOF-Lite"), the development of novel systematic data-capture (including GP contact data) or collaboration on an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs[46,47]. General Practice, however, is under huge time and resource pressures[53]. Any proposed alternatives will have to fulfil the primary requirements of being a streamlined process for supporting coordination of care, especially for those with complex health needs. The recent national review of QOF concluded that QOF should be reformed to become more person-centred, create space for professionalism and optimally impact wider population health and system resource utilisation[54].

FIGURE LEGENDS

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see supplementary data).

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DATA SHARING STATEMENT

Data available via email from james.close@plymouth.ac.uk,

ETHICS AND FUNDING

Ethical clearance was obtained from the Plymouth University Ethics Committees (FREC). All participants were given an information pack about the study, and gave informed consent.

This research was supported by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care South West Peninsula. Funding for this evaluation was provided South West Academic Health Sciences Network (SWAHSN).

CONTRIBUTIONS

J Close corresponded with partaking practices, collected data, analysed data and compiled manuscript.

B Fosh input, validated and analysed data.

H Wheat corresponded with partaking practices and collected data.

J Horrell corresponded with partaking practices and collected data.

W Lee supported the Interrupted Time Series analysis.

R Byng aided study design and conception.

Bainbridge M corresponded with partaking practices and data collection.

L Witts helped with study design, data collection and corresponded with partaking practices.

R Blackwell collected and analysed data for Hospital Episode Statistics.

L Hall corresponded with partaking practices and collected data.

Lloyd H designed and oversaw the study from inception to completion.

All authors read, contributed to and approved the manuscript.

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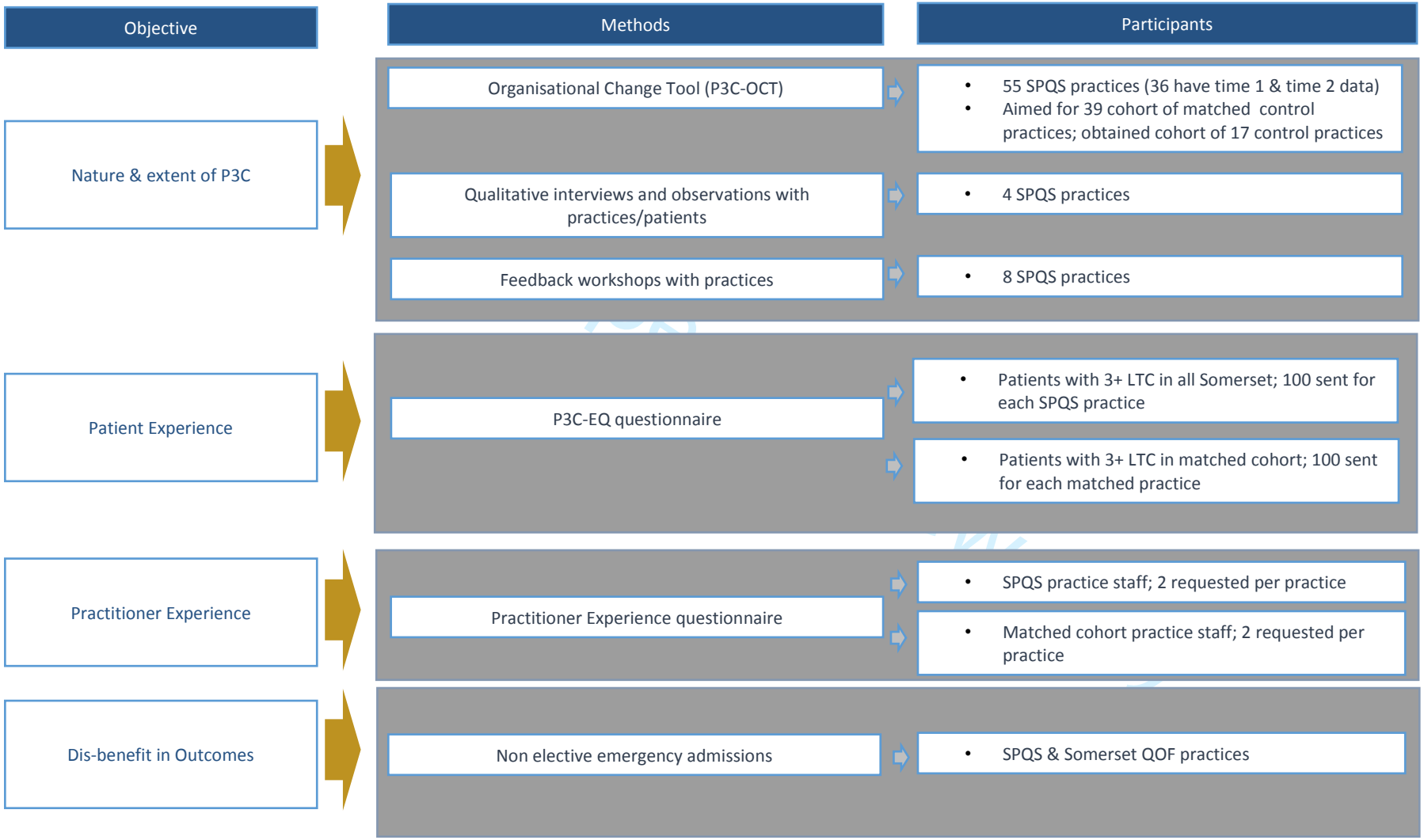
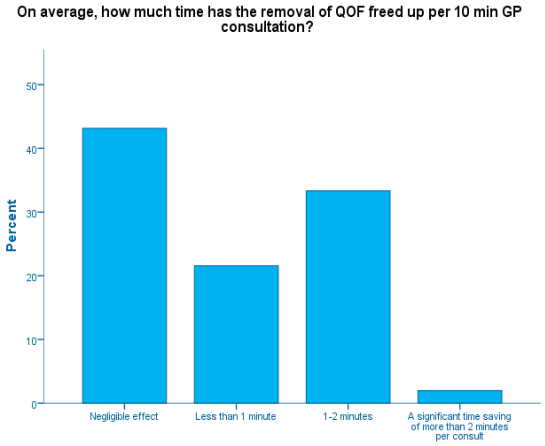
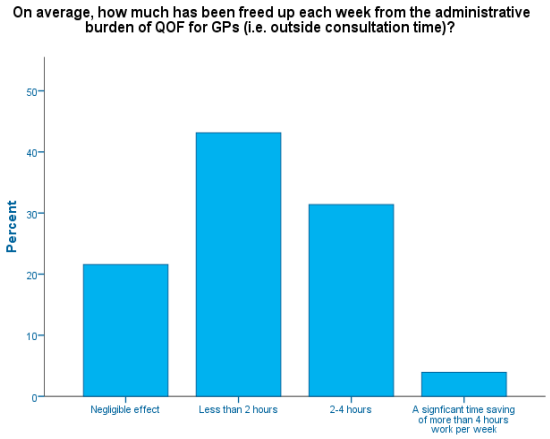
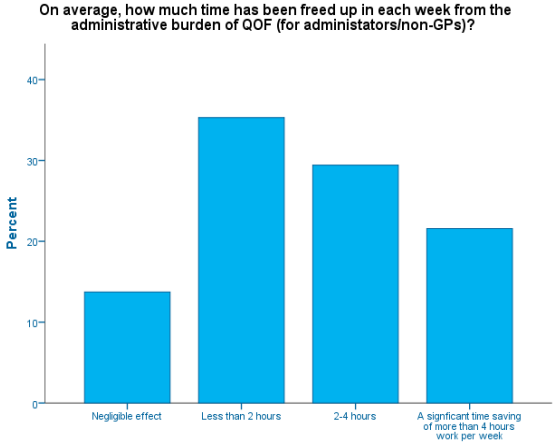
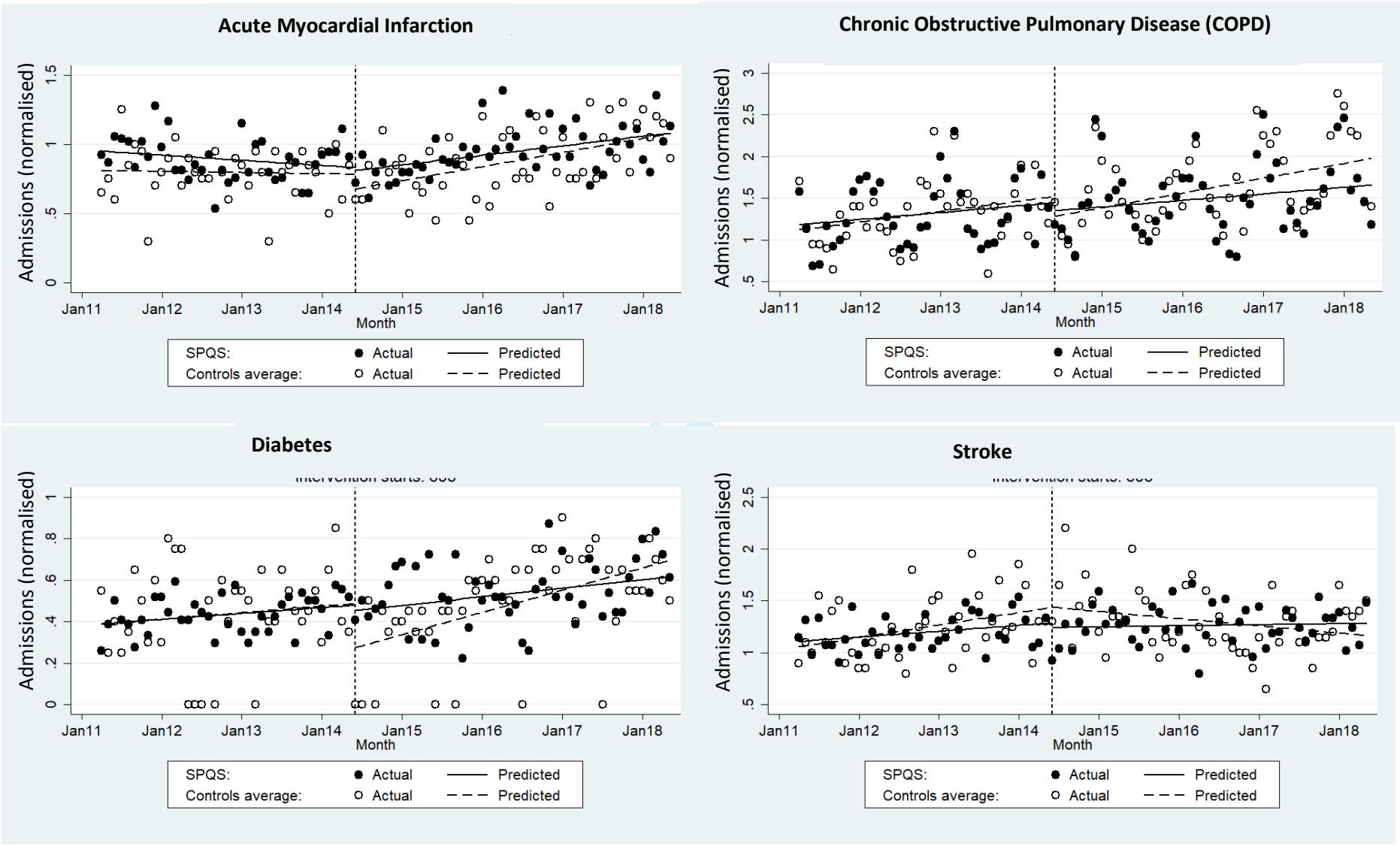

Objective
Methods
Participants
Nature & extent of P3C
Organisational Change Tool (P3C-OCT)
55 SPQS practices (36 have time 1 & time 2 data)
Aimed for 39 cohort of matched control practices; obtained cohort of 17 control practices
Qualitative interviews and observations with practices/patients
4 SPQS practices
Feedback workshops with practices
8 SPQS practices
Patient Experience
P3C-EQ questionnaire
Patients with 3+ LTC in all Somerset; 100 sent for each SPQS practice
Patients with 3+ LTC in matched cohort; 100 sent for each matched practice
Practitioner Experience
Practitioner Experience questionnaire
SPQS practice staff; 2 requested per practice
Matched cohort practice staff; 2 requested per practice
Dis-benefit in Outcomes
Non elective emergency admissions
SPQS & Somerset QOF practices








Acute Myocardial Infarction
Admissions (normalised)
0
.5
1
1.5
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Chronic Obstructive Pulmonary Disease (COPD)
Admissions (normalised)
.5
1
1.5
2
2.5
3
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Diabetes
Admissions (normalised)
0
.2
.4
.6
.8
1
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Stroke
Admissions (normalised)
.5
1
1.5
2
2.5
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted

Supplementary Table 1: Overview of Sustainability and Transformation Plan (STPs) for 28 of 55 practices enrolled in SPQS; with 2 further STPS (Taunton federation and West Somerset) completed at federation level.

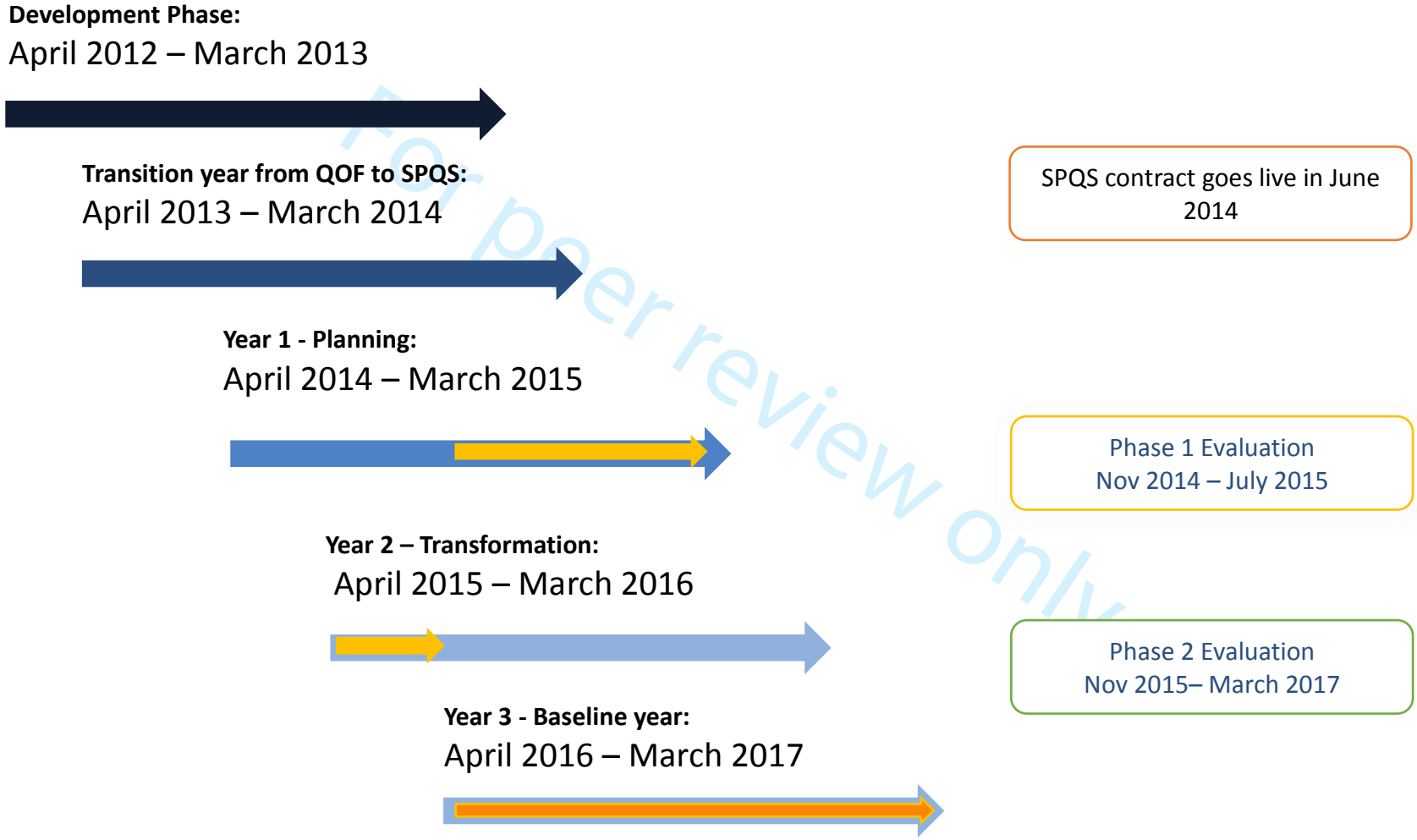
Development area	East Mendip			West Mendip					Central Mendip			North Sedgemore		Bridgewater Bay
	Beckingdon	Frome	Mendip County	Glastonbury Health	Glastonbury Surgery	Vine	Wells City	Wells Health	Grove House	Oakhill	Park Medical	Axbridge & Wedmore	Brent & Burnham	North Petherton
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Continued/increased involvement in Mendip Your Health & Wellbeing	✓					✓		✓	✓		✓			
Use/development of technology to assist self-management		✓		✓										
Increased use of Health Connectors Mendip		✓				✓			✓	✓				
Investing time in community engagement		✓												
MDTs in care coordination hubs		✓												
MDTs with district nurses at palliative care reviews (weekly)		✓												
Engagement in compassionate communities and network mapping		✓												
Increased or continued participation with Symphony				✓		✓	✓	✓	✓		✓			
Possible division of urgent and routine care & formation of urgent care hub				✓		✓		✓				✓	✓	
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)		✓	✓	✓				✓	✓		✓		✓	
Consideration of practice merger				✓		✓	✓	✓	✓					
Training & upskilling									✓					
Engagement in Somerset together programme											✓			
Development of personalised care planning											✓			
Telephone consultations/ telemedicine														
Use of health coaches														

Engagement in Living Better programme																

Development area	South Somerset														Taunton Federation	West Somerset
	Bruton	Illchester	Buttercross	Yeovil	Crewkerne	Hamdon	Oaklands	Ryalls Park	Hendford Lodge & Abbey	Wincanton	Westlake	Martock & S. Petherton	Penn Hill	Preston Grove		
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	✓	✓	✓									✓	✓	✓	✓	✓
Continued/ increased involvement in Mendip Your Health & Wellbeing																
Use/development of technology to assist self-management															✓	
Increased use of Health Connectors Mendip																
Investing time in community engagement												✓				
MDTs in care coordination hubs																
MDTs with district nurses at palliative care reviews (weekly)																
Engagement in compassionate communities and network mapping																
Increased or continued participation with Symphony					✓	✓	✓				✓		✓	✓		
Possible division of urgent and routine care & formation of urgent care hub																✓
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)	✓	✓	✓	✓		✓		□	✓	✓			✓			✓
Consideration of practice merger											✓					✓
Training & upskilling	✓	✓	✓	✓												
Engagement in Somerset together programme																
Development of personalised care planning																
Telephone consultations/ telemedicine	✓	✓														
Use of health coaches	✓	✓				✓		✓	✓	✓		✓	✓	✓		

Engagement in Living Better programme																✓

Supplementary Figure 1: Timeline of SPQS scheme and evaluation.



Full results of P3C-Practitioner questionnaire

Selection of P3C-Practitioner

The P3C-practitioner was selected for this study by initially conducting a scoping review to identify measures that included aspects of professional experiences of integrated/coordinated care. This identified 33 measures, four of which were deemed relevant (Safety Net Medical Home Provider Experience Survey; Person-Centred Health Care for Older Adults Survey" (PCHCOA) – which we refer to as the "P3C-practitioner"; Staff Questionnaire - Integrated Care Evaluation Pilots; North West London Integrated Care Pilot - Practitioner Survey). These measures were then presented to workshop attendees (healthcare professionals; managers; senior NHS England representatives; local commissioners; academics) to explore the strengths and weaknesses in terms of applicability and utility as part of routine data collection in respective settings. The PCHCOA was selected due to its established psychometric properties (Briony Dow et al., *Development and initial testing of the Person-Centred Health Care for Older Adults Survey*, 25 *International Psychogeriatrics* 1065–1076 (2013)), its good coverage of domains of P3C and a positive response at the feedback workshop. For the purposes of this evaluation, we have renamed the instrument the P3C-practitioner.

Scoring of P3C-Practitioner

Whilst previously validated, the authors did not develop an aggregate scoring mechanism for the instrument. Therefore, we generated summary scores by simple addition from the 4-point Likert scale (Never = 0; Rarely = 1; Sometimes = 2; Usually = 3; Always = 4). This allowed us to compare aggregate scores to compare SPQS versus controls over all 29 questions (see table below), with significance tested using MWW test. We also generated sub-scales by addition of question relevant to this aspect of P3C (see following page for questions). No significant differences were detected in practitioner experiences in SPQS or control practices, for either mean scores or the following subscales.

Sub-Scale: Person Centred Care = Questions 1.1, 1.3, 1.4, 2.1, 2.2, 5.1, 6.1,6.2,6.3, 7.1, 7.2, 7.3, 8.1 8.2 and 8.3.

Sub-Scale: Coordinated Care = Questions 4.1, 4.2, 4.3

Sub-Scale: Working Environment = Questions 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7

	QOF	SPQS	Sig. (2-tailed)
Mean Score	**83.79 (n=29)**	**86.18 (n=98)**	**.4**
Sub-Scale: Person Centred Care	47.62	49.11	.35
Sub-Scale: Coordinated Care	7.41	8.38	.12
Sub-Scale: Working Environment	22.03	21.11	.24

P3C-Practioner instrument

Q1.1 In my work area, service users / patients have an equal say with the rest of the team in the development of the support plan.

Q1.2. In my work area, service users / patients and carers have an equal say with the rest of the team in the development of the discharge plan or exit strategy from the service.

Q1.3. My/our support plans are structured around the service user's/patient's goals.

Q1.4. Where I currently work, we provide services in the location that best suits the needs and preferences of the service user/patient and their carers.

Q2.1. I ask service users/patients what their goals/needs are for their health and wellbeing.

Q2.2 I ask the carer/s what their goals/ needs are for the health and wellbeing of the person they support.

Q3.1. I am supported to develop the skills I need to work with the service user/patient and their carers.

Q3.2. Where I am currently working, I have been exposed to good role models in care/support for service users/patients.

Q3.3. Expectations of my role and how I treat the service users/patients I support are communicated clearly and consistently.

Q3.4. I feel that I work as part of a team with a recognised and valued contribution.

Q3.5. The emotional and physical demands of my work are acknowledged and recognised.

Q3.6. I feel that I am able to fully use my skills in my work with the service users/patients

Q3.7. My work environment values the care/support I provide to the service users/patients.

Q4.1. It is clear to the service user/patient or their carer who their key worker is.

Q4.2. The service user/patient and their carer have ready access to a key identified person (i.e. they are available by phone, messages are returned promptly).

Q4.3. Where I currently work, we know how to direct the service user/patient to the most appropriate service without them having to make another call (single point of contact).

Q4.4. After the service user/patient is discharged/leaves the service, they receive a follow-up phone call or visit.

Q5.1. Where I currently work, adequate transport and parking are provided to ensure access for service users/patients and their families/carers.

Q5.2. Where I currently work, service users'/patients' personal privacy is respected.

Q6.1. I am able to meet the communication needs of service users/patients and their carers when working with them.

Q6.2. Written materials are provided by my place of work to service users/patients and their carers in a language they can understand.

Q6.3. Information is provided in a variety of ways to ensure all service users/patients and their carers have access (e.g. written, verbal, visual).

Q7.1. I welcome it when service users/patients are informed and question or challenge my advice.

Q7.2. The needs and preferences of service users/patients should be central in all services.

Q7.3. I like working with the service users/patients I support or care for.

Q8.1. It is an important part of my job to get to know my service user/patient (e.g. call them by their preferred name, remember and repeat something they have told me).

Q8.2. I give service users and their carers adequate time to talk to me (e.g. to discuss their concerns and their expectations).

Q8.3. I seek to find out what is important to service users/patients about their health and wellbeing (e.g. mobility, cognitive function, being part of the family, able to go to the gym).

Supplementary File 4: Results of interrupted time-series analysis for emergency admissions on four long-term, ambulatory care sensitive conditions (ACSCs). Full results are provided, although the most relevant statistical tests (column "P>|t|") are for the rows:

"_z_x653" the difference between the changes in intercept for SPQS and QOF pre/post intervention)

"_z_x_t653" the difference between the changes in gradient for SPQS and QOF pre/post intervention.

All are non-significant, revealing no excess increases in emergency admissions in SPQS practices for these four ACSCs after the implementation of the SPQS scheme. Significant differences were observed, however, for changes in the *control* slope and/or intercept pre/post intervention for Acute Myocardial Infarction, Stroke and Diabetes. These are highlighted in red below.

Acute Myocardial Infarction (AMI)

		Newey-West				
Description	**PRIM_AMI**	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**
Pre-intervention control gradient	_t	-.0007003	.0025541	-0.27	0.784	-.0057435 .0043429
Difference between control/SPQS pre-intervention intercepts	_z	.1396686	.0801094	1.74	0.083	-.0185102 .2978475
Difference between control/SPQS pre-intervention slopes	_z_t	-.0024182	.0034503	-0.70	0.484	-.009231 .0043946
Change in control intercept	_x653	-.1043759	.0677199	-1.54	0.125	-.2380911 .0293393
Change in control slope	**_x_t653**	**.0091594**	**.0030779**	**2.98**	**0.003**	**.0030819 .0152369**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.0853708	.0946241	0.90	0.368	-.1014677 .2722093
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0003106	.0040914	-0.08	0.940	-.0083892 .0077679
Intercept of control pre-intervention	_cons	.8103239	.0652408	12.42	0.000	.6815037 .9391441

Chronic Obstructive Pulmonary Disease (COPD)

Description	PRIM_COPD	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0105427	.0048903	2.16	0.033	.0008867	.0201988
Difference between control/SPQS pre-intervention intercepts	_z	.0619958	.1748488	0.35	0.723	-.2832492	.4072408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0035803	.0077243	-0.46	0.644	-.0188323	.0116717
Change in control intercept	_x653	-.2382072	.1889151	-1.26	0.209	-.6112265	.1348121
Change in control slope	_x_t653	.0041691	.0078257	0.53	0.595	-.011283	.0196211
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.1413474	.2797523	0.51	0.614	-.4110331	.693728
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0046434	.011329	-0.41	0.682	-.0270129	.0177261
Intercept of control pre-intervention	_cons	1.122065	.1089517	10.30	0.000	.9069359	1.337194

Stroke

Description	PRIM_STRK	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0100503	.0041188	2.44	0.016	.0019176	.0181831
Difference between control/SPQS pre-intervention intercepts	_z	.0528715	.0954745	0.55	0.580	-.1356461	.2413891
Difference between control/SPQS pre-intervention slopes	_z_t	-.0053472	.0047727	-1.12	0.264	-.014771	.0040765
Change in control intercept	_x653	-.0003719	.1374057	-0.00	0.998	-.2716843	.2709404
Change in control slope	**_x_t653**	**-.0158336**	**.005394**	**-2.94**	**0.004**	**-.0264841**	**-.005183**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	-.0449425	.1616696	-0.28	0.781	-.3641647	.2742798
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0119868	.0062141	1.93	0.055	-.0002831	.0242568
Intercept of control pre-intervention	_cons	1.05749	.0852406	12.41	0.000	.8891793	1.2258

Diabetes

Description	PRIM_DIAB	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0025823	.0026916	0.96	0.339	-.0027323	.0078969
Difference between control/SPQS pre-intervention intercepts	_z	.0005698	.0759019	0.01	0.994	-.1493012	.1504408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0001994	.0029745	-0.07	0.947	-.0060726	.0056738
Change in control intercept	**_x653**	**-.2114749**	**.0751425**	**-2.81**	**0.005**	**-.3598463**	**-.0631036**
Change in control slope	_x_t653	.0063408	.0033715	1.88	0.062	-.0003164	.012998
difference between the changes in intercept for SPQS and QOF pre/post intervention	**_z_x653**	**.1864524**	**.0866148**	**2.15**	**0.033**	**.0154285**	**.3574763**
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0052892	.0038335	-1.38	0.170	-.0128586	.0022802
Intercept of control pre-intervention	_cons	.3890688	.0704267	5.52	0.000	.2500088	.5281288

Combined (AMI/COPD/Stroke/Diabetes

Description	SECD_AMI	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0224751	.0064245	3.50	0.001	.0097898	.0351604
Difference between control/SPQS pre-intervention intercepts	_z	.2551058	.227217	1.12	0.263	-.193542	.7037535
Difference between control/SPQS pre-intervention slopes	_z_t	-.0115452	.009923	-1.16	0.246	-.0311385	.0080482
Change in control intercept	**_x653**	**-.5544301**	**.2489365**	**-2.23**	**0.027**	**-1.045964**	**-.0628964**
Change in control slope	_x_t653	.0038357	.0103935	0.37	0.713	-.0166866	.024358
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.3682284	.3741294	0.98	0.326	-.3705031	1.10696
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0017436	.0148231	0.12	0.907	-.0275252	.0310124
Intercept of control pre-intervention	_cons	3.378947	.1531439	22.06	0.000	3.07656	3.681335

STROBE Statement—checklist of items that should be included in reports of observational studies

	PAGE/LINE NUMBER IN MANUSCRIPT	Recommendation
Title and abstract	p2	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	P3-5	Explain the scientific background and rationale for the investigation being reported
Objectives	L126-132	State specific objectives, including any prespecified hypotheses
Methods		
Study design	L135-145	Present key elements of study design early in the paper
Setting	Setting L135-145; dates L210-217	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	L148-168	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	L169-198	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	L169-198	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	L158-161	Describe any efforts to address potential sources of bias
Study size	L149-151	Explain how the study size was arrived at

Quantitative variables	L209-235	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	L209-235	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	L239-247	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	Table 1	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	L239-282	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	L239-357	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	N/A	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	L360-397	Summarise key results with reference to study objectives
Limitations	L405-413	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	N/A	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	N/A	Discuss the generalisability (external validity) of the study results
Other information		
Funding	L451-6	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

A Longitudinal Evaluation of a Countywide Alternative to the Quality Outcomes Framework in UK General Practice, Aimed at Improving Person Centred Coordinated Care.

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A Longitudinal Evaluation of a Countywide Alternative to the Quality Outcomes Framework in UK General Practice, Aimed at Improving Person Centred Coordinated Care.

Close, James james.close@plymouth.ac.uk

Corresponding author.

University of Plymouth, Community and Primary Care research group
ITTC Building
Davy Road, Plymouth Science Park
Derriford, Plymouth
Plymouth, UK PL6 8BX
01752 764260

Fosh, Ben Ben.fosh@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW
07860593505

Wheat, Hannah H.Wheat@exeter.ac.uk

University of Exeter, Sociology, Philosophy and Anthropology department
Exeter, UK

Horrell, Jane jane.horrell@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW
01752 764260

Lee, William william.lee@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW

Byng, Richard richard.byng@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW

Bainbridge, Michael Michael.Bainbridge@somersetccg.nhs.uk

NHS Somerset Clinical Commissioning Group
Yeovil, Somerset, UK

Blackwell, Richard Richard.Blackwell@swahsn.com

South West Academic Health Science Network
Exeter, UK

Witts, Louise Louise.Witts@swahsn.com

South West Academic Health Science Network
Exeter, UK

Hall, Louise Louise.Hall@swahsn.com

South West Academic Health Science Network
Exeter, UK

Lloyd, Helen helen.lloyd-1@plymouth.ac.uk

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Evaluation of a Countywide Alternative to the Quality Outcomes Framework, Aimed at Improving Person Centred Coordinated Care.

Abstract

Objectives.

To evaluate a county-wide deincentivisation of the Quality Outcomes Framework (QOF) payment scheme for UK General Practice (GP).

Setting

In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups. Fifty-five GP practices in Somerset established the Somerset Quality Practice Scheme (SPQS) – a de-incentivisation of QOF – with the goal of redirecting resources towards Person Centred Coordinated Care (P3C), especially for those with Long Term Conditions (LTCs). We evaluated the impact on care from April 2016 to March 2017.

Participants & Design

The evaluation used matched data from 55 SPQS practices and 17 regional control practices for three survey instruments. We collected patient experiences ('P3C-EQ'; 2363 returns from patients with 1+ LTC; 36% response rate), staff experiences ('P3C-practitioner'; 127 professionals), and organisational data ('P3C-OCT'; 36 of 55 practices at two time points, 65% response rate; 17 control practices). Hospital Episode Statistics emergency admission data were analysed for 2014-2017 for ambulatory-sensitive conditions across Somerset using interrupted time series.

Results

Patient and practitioner experiences were similar in SPQS versus control practices. However, discretion from QOF incentives resulted in time savings in the majority of practices and ractice data showed a significant increase in P3C oriented organisational processes, with a moderate effect size (Wilcoxon signed rank test; p=0.01; r=0.42). Care delivery was altered via stronger federation-level agreements and informal networks, increased multidisciplinary working, reallocation of resources for other health care professionals and changes to the structure and timings of GP appointments. No disbenefits were detected in admissions data.

Conclusions

The SPQS scheme leveraged time savings and reduced administrative burden via discretionary removal of QOF incentives, enabling practices to engage actively in a number of schemes aimed at improving care for people with LTCs. We found no differences in the experiences of patients or healthcare professionals between SPQS and control practices.

Article Summary

Strengths and limitations of this study

- This study evaluated changes to service delivery, conducted using two survey tools – offering a perspective on the experiences of both patients and healthcare professionals.
- These were supplemented with a longitudinal analysis of organisational change (to measure alterations to service deliver) and a time-series of emergency admissions for ambulatory-sensitive conditions (to detect disbenefits arising from the scheme).
- Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region.
- No detectable improvements were established in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, or changes to patient/practitioner experiences were somewhat distal to the intervention.

Main Text

BACKGROUND

The Quality Outcomes Framework (QOF) for UK General Practice (GP) is one of the largest health-related pay-for-performance (P4P) schemes in the world[1]. Following implementation in 2004, the scheme initially had a positive impact on quality of care, primarily achieved via establishment of consistent procedural baselines in the clinical management of incentivised (mostly chronic) diseases[1–5]. It reduced between-practice inequalities in care delivery[1–3] whilst also leading to improved disease registers, widespread recording of clinical activities and adoption of electronic medical record systems[1], leading to growth in GP data and related research[6,7].

Since the introduction of QOF, demographic shifts of an ageing population have continued to drive a shifting clinical landscape[8], with the number of people with three or more long-term conditions (mLTCs) thought to have risen by one million over the last decade[9]. The subsequent rising demand for the management of long term conditions (LTCs) and mLTCs – requiring tailored and coordinated support[10,11] – has led to QOF (with its emphasis on processes for single disease guidelines) being viewed as increasingly anachronistic[6,12–16]. After introduction of QOF, there was a significant reduction in the continuity of care[2,17] and the person-centeredness of GP consultations[13,14,18,19], with a subsequent decline in patients' satisfaction[20]. It has been argued that QOF does not incentivise appropriate clinical care for people with multimorbidity[6,12–16], who require individualised support, greater continuity of care and a holistic, biopsychosocial approach that is responsive and empowering[10,11]. An oft-quoted criticism is that QOF reduces consultations to 'box-ticking' exercise[21].

In response to such criticisms, both the NHS Chief Executive and the General Practitioners Committee (GPC) Chairman previously backed the removal of QOF[21] and In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups (CCGs), allowing organisations the freedom to develop alternatives. Potential advantages included the targeting of local health needs

and greater clinical engagement for quality improvement[22]. The Somerset Practice Quality Scheme (SPQS) was established in the same years as a de-incentivisation of QOF. It arose because GPs, the CCG and the Local Medical Committee (LMC) felt that QOF was not incentivising the highest value clinical behaviour. The goals were to allow clinicians the freedom to innovate, enable consultations to be more person-centred and increase involvement with a number of concurrent schemes aimed at improving Person Centred Coordinated Care (P3C)[23]. The details of the scheme were included in the SPQS contract[24] and local Sustainability and Transformation Plan (STPs – Plans for reforming healthcare mandated by the Five Year Forward View[25]) of the GPs[26]. (See Supplementary File 1 for a summary of Somerset STPSs; box 1 for brief details of the various schemes and references for details). The contract removed incentives from QOF, although CQRS (Calculating Quality Reporting System) remains active in order to collect prevalence data for payment calculations. The SPQS contract stated that the reduced QOF overhead would be exploited to better meet the needs of patients with long term conditions by developing new models of care. Implementation was specified in the locality STPs, which included a patchwork of initiatives, most notably the 'Test and Learn pilots', which encompassed three distinct schemes (box 1), all of which had a shared vision of targeting complex patients with care plans, multidisciplinary team input (MDT) and single point of contact [27,28] . Other schemes included a Village Agents service[29] and Health Connections Mendip (HCM)[30] – see box 1. Fifty five Somerset practices opted for SPQS, with 18 Somerset practices (initially 20) retaining the existing QOF contract. (The SPQS practices increased to 57 in 2015/16; but two mergers reduced it back to 55).

Test & Learn: Comprises three similar initiatives (South Somerset Symphony Vanguard, Taunton, and Mendip – see below), which share a common goal of targeting complex, multimorbid patients with a suite of approaches including single personalised care plans, multi-disciplinary team input and single point of access to provide person centred coordinated care.

> **Test & Learn – South Somerset Symphony Vanguard**: A symphony "hub" system located at Yeovil District Hospital, where complex patients receive extra support from Health Coaches/Key Workers at the Symphony hub service, although they remain under management of GP practice [27,28].
>
> **Test & Learn – Taunton:** Operates under a "virtual hub" model, with complex/frail patients managed by a multidisciplinary team moving between practices, with shared care plans and Wellbeing Advisors.
>
> **Test & Learn – Frome Mendip, including "Health Connections Mendip".** With loose eligibility criteria and a number of referral routes, Community Practice Nurse and Health Connectors (based at Frome) liaise regularly in MDT meetings. There is a hub telephone line for single point of access. The model advocates utilising existing assets in the community. The Health Connections team lead social prescribing work with a service directory to signpost patients to appropriate resources [30].

Enhanced Primary Care (EPC): EPC is a sub-component of the Symphony vanguard scheme that incorporates health coaches (HCs) into primary care, focusing on less complex patients, allowing GPs to focus primarily on medical problems.

Village Agents Service: Supports isolated, excluded and vulnerable (including elderly and multimorbid) people by offering a signposting and referral service. The service links with general practices [29].

Living Better: A working partnership between the GP practices in the pilot, AGE UK Somerset, Social Care, Somerset Partnership, West Somerset District Council, and Somerset Clinical Commissioning Group. The project supports people with one or more long-term conditions to better self-manage, helping them build connections to the community and reducing dependency on health and social care.

Box 1. Initiative for implementation of SPQS, as discussed in Supplementary File 1.

The initial phase of the scheme was previously evaluated with a retrospective approach[31]. This revealed early stages of organisational change,, including stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources towards health care assistants, nurses and others, and changes to structure and timings of appointments with GPs. From April 2016 to March 2017 we conducted a longitudinal evaluation of the second full year of the SPQS programme (see Supplementary File 2 for a timeline of the SPQS scheme and associated evaluations). This was commissioned with the aims of establishing the nature and extent of P3C that

has been implemented since discretion from QOF, explore staff and patient experiences of care delivery and examine non-elective hospital admissions before and after inception of the scheme.

METHODS

We conducted a mixed-methods evaluation of SPQS which included a suite of quantitative and qualitative tools. Analysis of quantitative data is described in this paper. In-depth qualitative findings will be published in a subsequent paper (including semi-structured interviews with practitioners; observations of consultations and facilitation workshops with practices). A schematic overview of the full SPQS evaluation framework is provided in figure 1. The quantitative evaluation included completion of survey tools targeting patient experiences (P3C-EQ), staff experiences (P3C-practitioner) and organisational perspectives (P3C-OCT tool), alongside time series of Hospital Episode Statistics (HES) for ambulatory-sensitive conditions across Somerset. We chose not to use national measures of General Practice (i.e. GP Patient Survey (GPPS) and Friends and Family Test (FFT)): they have a broad sample and do not target the patient group (i.e. patients with LTCs) that are the focus of SPQS. Furthermore, they do not target the construct of interest (i.e. P3C).

<figure 1 here>

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Samples

The 55 participating Somerset practices (mean list size = 7,695; median = 6515.5; smallest = 1834; largest = 29,078) completed our evaluation tools (see below). Whilst these 55 practices were incentivised to take part in our evaluation (i.e. by being part of SPQS), the non-SPQS Somerset practices had no incentive to act as controls and did not participate in this study. Therefore, for control practices, we initially identified a cohort of non-Somerset control practices matched for staffing data, list size, population density, indices of multiple deprivation, QOF scores and disease prevalence. However, the incentives available for this evaluation (£200 per practice) were only sufficient to recruit six practices by this method. We therefore supplemented this group with 11 unmatched practices from across the Southwest, making a total of 17 control practices (mean list size = 6,714; median = 4878; smallest =2678; largest = 4878). The control group therefore represents a self-selected sample of practices that are likely to represent engaged, active practices (i.e. with the resources to engage with research). In contrast, completion of our evaluation was mandatory for all SPQS practices.

Patient and Public Involvement

Patients were involved via the peninsula CLAHRC patient involvement group (PenPig), who set priorities for research objectives. Patients, public and healthcare professionals were also involved in co-design workshops to develop the measurement framework and individual questionnaires (see papers for details [23,32–37]). Patients also reviewed drafts of ethics approval applications and all patient-facing communication. The work was co-presented with patients at the South West Society for Academic Primary Care Regional Meeting 2018.

Survey Tools

The P3C-Patient Experience Questionnaire (P3C-EQ) is a brief, 11-item patient-completed measure of patient experiences of person centred coordinated care delivery, which we have previously

validated[32,38,39]. The tool can be used to generate an aggregate score of patient experience[32], with a range of score from 0-30, where a higher score indicates better experiences of care [39]. It can also be sub-scored to previously described sub-domains of P3C[23,32,34–37].

The P3C-Practitioner Experience Survey is a 29-item instrument that measures individual and managerial experience of delivering person centred and coordinated care Via a workshop with healthcare professionals, we selected the previously validated P3C-Practitioner questionnaire (also known as the Person-Centred Health Care for Older Adults Survey[40]) as the most suitable instrument to examine practitioners' perspectives of P3C (see Supplementary File 3). A minimum of two practitioners from each practice were requested to respond. The instrument generates an aggregate score with a range of 29-145, where a higher score indicates better experiences of care.

The P3C-Organisational Change Tool (P3C-OCT) is an evidenced-based measure of progress towards delivering person centred coordinated care from an organisational perspective[33]. It was developed to support and measure P3C in line with Year of Care[34] and RCGP principles of Collaborative Care and Support Planning[41], thus providing a way to monitor changes in line with policy directives which improve P3C. The tool was designed to measure all core P3C routines which have been identified through research[42,43], patients' accounts, policy documents[34] and our own work[23,33]. The design of the P3C-OCT is based on a shared consensus of the components of person-centred coordinated care (e.g. [35,36,44]), which broadly correspond to six domains: Information and Communication; Care Planning; Goals and Outcomes; Transitions; Organisational Process Activities; and Decision Making. These domains have been mapped to real-world actions that support the delivery of P3C (e.g. multi-disciplinary team meetings, care planning, provisions for information etc.) This allows the tool to translate concepts which are often abstract, and may be drawn from academic literature and policy documents, into actionable, tangible processes which a practice can implement. The result is a unique 29-question instrument with over 500 different possible responses, which provides a detailed and practical interrogation of P3C delivery. An equally-weighted scoring system allows results of the P3C-OCT to be aggregated into a single composite score, or alternatively by sub-domains of P3C – generating a score of 0-20, with higher scores indicating more P3C related activity.

The P3C-OCT provides a detailed profile of care delivery and organisation through 29 core questions. All questions ask about objective activities (e.g. processes in place to deliver P3C) and subjective responses (e.g. how well these are working). Scores are given out of a theoretical maximum of 20 points. The P3C-OCT was also prepended by a series of SPQS-related questions about administrative and consultation time savings from discretion from QOF. Each SPQS practice was requested to complete the P3C-OCT at two time points (from Feb-Aug 2016 and Dec 2016-Mar 2017). In contrast, control practices only completed the P3C-OCT once (at Time 2).

Data Collection

All participating practices supported data collection of the three survey tools. With the P3C-EQ, from each practice, 100 patients with one or more LTCs, randomly sampled from the practice list (using a customised EMIS script), were invited to complete a postal questionnaire at a single time point. Patients received an information pack, consent sheet, demographic questionnaire and P3C-EQ. All returned questionnaires were entered into a Microsoft Access database prior to statistical analyses. For the P3C-Practitioner, we obtained an opportunity sample via both written and email communication with all participating practices. For the P3C-OCT, all participating practices were

offered an electronic or paper version, and we requested that the tool was completed by a combination of General Practitioner and Practice Manager (PM), thus ensuring representation of front-facing and backend operations of GP surgeries. Completion of the tool was mandatory as part of the SPQS evaluation.

Analysis

SPQS and control practices were compared on the P3C-Patient Experience survey and the P3C-Practioner Experience Survey (at time 2; 6-12 months after initiation of second year/phase 2 of SPQS), with significance tested using the non-parametric unmatched Mann–Whitney–Wilcoxon (MWW) test taking into account within-practice clustering by calculating Somers' D statistic (non-parametric tests were used as the scoring is a summation of Likert responses i.e. data was ordinal). For the P3C-Organisational Change Tool, we compared Time 1 (immediately after implementation of second year/phase 2 of SPQS) and Time 2 (6-12 months later), with significance evaluated by Wilcoxon signed rank test.

Time Series of emergency admissions to hospital

A multi-group interrupted time-series analysis (ITS) was conducted to identify whether de-incentivisation of QOF and the introduction of SPQS was associated with changes in emergency admissions to acute hospitals with a primary diagnoses for four long-term, ambulatory care sensitive conditions (ACSCs). Hospital episode statisticswere obtained for patients from all 55 GP practices enrolled in the SPQS scheme (actually 56 practices in 2015/15) and 18 Somerset QOF practices (i.e. Somerset practices not enrolled in SPQS; initially 20). Data was obtained for a 70 month period from April 2011 to May 2018. This time period is divided into 38 months pre-intervention (Apr 2011 – May 2014) and 48 months post intervention (June 2014 – May 2018; SPQS contract went live in June 2014, month 39). Data include monthly admission counts for four ACSCs: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes, and Stroke. We selected these ACSCs as a proxy for preventable admissions and an indicator of any deteriorating quality of care associated with SPQS. Due to the difference in number of practices between SPQS and QOF practices, admissions were divided by the number of practices, thus providing an average of emergency admissions (expressed as admissions per month per practice). Analysis was performed using the *itsa* command[45] on STATA (StataCorp Ltd). This uses regression-based model with Newey-West standard errors. Pre- and post-intervention slopes/intercepts of the sample (SPQS practices) were compared to controls (QOF practices). Lag period was set to 1 month.

RESULTS

P3C-EQ

There were 1,752 responses received from 49 (89%) of the 55 practices enrolled in SPQS, and 611 responses from patients enrolled in the 17 control (QOF) practices (36% response rate and similar to other similar other studies[46]). The responses of the two groups compared in Table 1.

Table 1: Demographic profile of responses to P3C-EQ as percentages.

Participant demographics as a percentage										
Age			**Education**			**Gender**			**Multi-morbidity**		
	QOF	SPQS		QOF	SPQS		QOF	SPQS	**No. LTCs**	QOF	SPQS
<=24	0.3	0.4	None	1.0	1.3	Male	44.0	43.4	1	19.6	20.1
25-34	2.5	1.3	Primary	3.1	2.1	Female	53.8	53.9	2	19.6	23.8
35-44	2.5	2.6	Secondary	33.7	34.6	Non-response	2.2	2.7	3	20.6	17.8
45-54	8.8	5.3	College/Vocational	26.4	28.1				4	11.3	13.7
55-64	18.3	13.3	Undergraduate	11.5	10.8				5	9.3	7.5
65-74	25.7	29.2	Postgraduate	8.2	7.8				6	4.7	5.1
75-84	29.3	32.7	Non-response	16.2	15.3				7	2.8	2.8
>=85	12.1	14.1							>=8	4.2	2.8
Non-response	0.5	1.0							Non-response	7.9	6.4

The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1,752) and QOF controls (23.68, n. 611) were not significantly different (MWW U test; *p=0.346*), and indicate generally positive experiences of care across both samples.

P3C-Practitioner results

Full results of the P3C-Practioner are provided in Supplementary File 3. We received 98 responses from 55 SPQS practices and 29 responses from 18 control practices from a mix of healthcare professionals – 62 GPs (49%); 35 Nurses (27%); 12 Wellbeing Advisors; 7 LTC nurse; 11 others. The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1752) and QOF controls (23.68, n. 611) were not significantly different (MWW test; *p=0.405*). Return rates are not applicable, as this was a convenience sample where we requested response from at least two different professionals at each practice.

P3C-OCT Results

To evaluate changes to P3C during the SPQS scheme we undertook an analysis of the organisation and delivery of care using the P3C-OCT. Of 55 practices enrolled in the scheme, 36 practices provided admissible data (i.e. complete and timely) at the two evaluation time-points (Time 1: 2/2016–8/2016 and Time 2 was 12/2016-5/2017; 65% response rate). This revealed an increase (0.9; p=0.034) in aggregate scores on the P3C-OCT between T1 (5.8) to T2 (6.7). This therefore represents a measurable increase in activity towards person centred coordinated care delivery and organisation (see table 2), with a moderate effect size (r=0.42). To determine the specific areas of person centred coordinated care (P3C) that improved during the evaluation, this was examined by domains of P3C[34–36]. When

broken into subdomains of P3C, significant improvements were delivered in areas related to 'Goals and Outcomes' (e.g. goal setting with patients; 1.7 increase, *p*=0.00; large effect size *r*=0.61).

Table 2: Mean changes in P3C-OCT scores between time 1 and time 2 for 36 paired practices. The top row provides the total OCT score (out of a maximum of 20), followed by domains of P3C. The OCT score for each domain is given for time 1, time 2 and the difference between time 1 and 2. The statistical significant of these differences is indicated by *p-value* from Wilcoxon signed rank test. Statistically significant results (at the level p<0.008; corresponding to a Bonferroni adjustment for 6 tests at the p<0.05 significance level) are indicated in bold font and with an asterisk next to the *p*-value. Effect sizes were calculated as test statistic *z* by the square root of the number of pairs.

	Time 1	**Time 2**	**Change T1→ T2 (p-value; effect size)**
Total OCT Score:	**5.8**	**6.7**	**0.9 (*p*=0.01; *r*=0.42)***
Information & Communication	7.4	8.1	0.7 (*p*=0.25; *r* =0.19)
Care Planning	6.6	7.2	0.6 (*p*=0.14; *r*=0.25)
Goals & Outcomes	6.1	7.8	**1.7 (*p*<0.001; *r*=0.61)***
Transitions	4.9	5.2	0.3 (*p*=0.43;*r*=013)
Organisational Process Activities	4.3	5.2	0.9 (*p*=0.03;*r*=0.36)
Decision Making	3.8	4.4	0.6 (*p*=0.07;*r*=0.3)

Further to the longitudinal analysis, SPQS practices were also compared to a cohort of 17 non-SPQS practices from the South West (all control practices returned data at Time 2). Aggregate results for the P3C-OCT revealed that control practices had an aggregate score of 6.2 on the P3C-OCT, with no significant difference between SPQS and control practices either before (a score of 5.8 versus 6.2; *p=0.64*) or after (6.7 versus 6.2; *p=0.41*) the intervention

Discretion from QOF and time savings

When asking SPQS practices to complete the P3C-OCT, we also included a number of additional questions related to the SPQS scheme. We asked SPQS practices a subjective appraisal of time savings (both in GP consultations and administration) from enrolment in the scheme. These are shown in figure 2. More than half (55%) of the practices (28 of 51 practices that completed these questions) agreed that time had been freed up within the 10 minute standard consultation time.

<figure 2 here>

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

With regard to administrative time savings, more than three quarters of SPQS practices (40/51; 78 %) reported administrative (non-consultation time for practitioners) time savings since initiation of the scheme, with just over one third of these practices (14/51; 27%) reporting gains of more than 2 hours per week. For administrators and non-clinical staff, SPQS was reported to free up time for more than 86% (44/51) of practices with only 13 % (7/51) reporting a negligible effect. Free text response boxes confirmed the plans of the STPs (see introduction and Supplementary File 1), stating that efficiency had been leveraged for increased collaborative and federation-level working, including engagement with a number of schemes in Somerset designed to improve person centred and coordinated care e.g. "Better use of Symphony", "Engagement with EPC", "Rural Practice Network", "Health coaches", "Huddles", "P3C relevant training", "Replaced by other work such as Symphony/health coaching etc", "This hasn't shown a reduction in workload but rather a change in workload." In this manner, the time savings leveraged from QOF were not hypothesised to lead to an improvement of experiences for practitioners, but instead a shift in workload.

Retention of QOF elements

When asking SPQS practices to complete the P3C-OCT, we also included a number questions specific to the implementation of SPQS. When asked 'Are you still using components of the QOF?', nearly all practices enrolled in SPQS continued to use at least some aspects of QOF (only 1 out of 51 respondents to this question stated "none"; 86% of practices used "Some", "Most" or "All"). We further investigated the continued utilisation of QOF via a free-text response in the P3C-OCT questionnaire. This revealed that QOF was still (according to one practice) utilised by "applying individually, not 'point scoring'". A common aspect that was dropped was exception reporting, with time also being saved by avoiding "target chasing". Elements of QOF were also contractually retained such as the CQRS (Calculating Quality Reporting System). This remained active under the SPQS contract to allow data on prevalence and key indicators to be collected from practices via GPES (GP Extraction System), where prevalence figures are utilised in the SPQS payments calculation.

QOF also continued to be utilised for the monitoring of LTCs and recall of patients with LTCs for routine check-ups. Around a half of SPQS practices (n. 25) still use QOF for recall of at least some (or all) conditions (e.g. checking for recall requirements for patients with LTCs and the management of specific chronic diseases). Free text responses suggested that whilst recall was an essential function, the implementation under QOF was overly burdensome and not tailored for multiple morbidities. Some practices countered this by running in-house developed searches with a priority to "concentrate on an integrated LTC system". This suggests that that there is scope for collaboration to design an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs (as previously proposed[47,48]).

Time Series of Hospital Episode Statistics

Results of the ITS are shown in figure 3. No significant increases were detected in the slope post-intervention (i.e. after the initiation of the SPQS contract in June 2014) in emergency admissions for patients with a primary diagnosis of four ACSCs in SPQS practices. Full results of significance tests are provided in Supplementary File 4. The removal of QOF has had no significant effect on emergency

admissions for these four ACSCs at the time of intervention, or in the two years following. However, for the non-SPQS Somerset practices, a significant slope change (increase) in admissions for AMI and Diabetes were observed, and a significant slope change (decrease) for admissions for Stroke was observed. These changes in admissions are therefore unrelated to the SPQS contract (see discussion below).

<figure 3 here>

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see Supplementary File 4).

DISCUSSION

We observed a variety of responses to de-incentivisation of QOF in Somerset. Some QOF-related components remained mandatory (prevalence reporting). Some 'desirable' features of the QOF system were still used (e.g. prompts during consultation), others were adapted (e.g. patient recall) and some burdensome components dropped altogether (e.g. exception reporting).

Practices reported that these alterations had led to time and resource savings in both GP consultations and administration. These time savings were used to increase involvement in implementation projects such as Symphony Test and Learn, Village Agents, Health connections, and the South Somerset Vanguard. These were planned as part of the SPQS contract and associated ongoing healthcare reform. These local implementation projects are actively targeting service redesign for complex patient needs, using person centred coordinated care across practice contexts. These projects have involved stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources for health care assistants (including Health and Wellbeing Advisors and Health Coaches), nurses and others, single points of access for the patient, shared electronic record systems, increased use of care planning and changes to structure and timings of GP appointments. The results of our longitudinal P3C-OCT survey confirm significant improvements in P3C, suggesting that SPQS has been successful in its stated aims as a system lever for service redesign aimed at the delivery of greater person centred and coordinated primary care.

Whilst there is emerging evidence that P3C approaches can improve outcomes (particularly for complexity/multimorbidity)[36,49], we could not establish that the changes introduced via SPQS are leading to better outcomes for patients. Patient experience is downstream of the organisational changes occurring in Somerset, and any detectable improvement in patient outcomes may be delayed. The results of the patient P3C-EQ experience established a similar experience of care in Somerset compared to the control QOF practices (who represent active, research engaged-organisations, whereas completion of the survey was mandatory for SPQS practices; see methods). Similarly,

comparison of practitioner perspective of P3C to the control group revealed similar experiences in SPQS versus the control practices. These findings are broadly reflective of results from other initiatives, where – for example – patient-centred care for multimorbid patients recently revealed mixed effects on processes of care, but was not associated with measurable improvements in quality of life or other secondary outcomes, with the authors concluding that the initiative "supported changes in organisation more than it supported changing the clinicians' attitudes on which patient-centredness depends." [50]

In reference to disbenefits, we could find no evidence of increased admissions associated with SPQS. However, ITS did establish trend changes in admissions in non-SPQS Somerset practices (e.g. those practices that retained the QOF contract). A significant increase was observed in admissions with a primary diagnosis of AMI and Diabetes, and a significant decrease observed for those with a primary diagnosis of Stroke. It is, however, unlikely that relatively minor changes to QOF in the years 2014/15 and 2015/16 [51,52] have led to these observed trend changes in emergency admission.

Whilst the time series did not establish any disbenefits in SPQS practices, earlier evaluation of SPQS established that deincentivisation of QOF leads to inconsistent recording of QOF data. Subsequently, analysis of QOF scores have little utility in assessing the quality of care in Somerset[31]. This paucity of data represents a major disbenefit of QOF deincentivisation: one of the primary benefits of QOF has been the widespread recording of clinical activities[1] and availability of GP data and research[6,7]. It is not currently clear how 'quality' could be assessed in the post-QOF landscape – a question that has major implications for research, evaluation, healthcare management.

Limitation of the study

The ability to draw firm conclusions from this study were limited by several factors. Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region. These represented a biased cohort of research-engaged practices. We could not detect improvements in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, the controls were unsuitable, or changes to patient/practitioner experiences were somewhat distal to the intervention.

Implications for the future

Whilst previous calls for the removal of QOF in England [53] have not been reiterated, recent policy has seen moves towards a reformed, streamlined version of QOF [54,55]. With QOF continuing to evolve, lessons from SPQS have implications for UK policy. We have previously made a number of suggestions for the future landscape of QOF[47,48]. These include retaining limited components of QOF (e.g. those elements that are desirable by GPs; "QOF-Lite"), the development of novel systematic data-capture (including GP contact data) or collaboration on an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs[47,48]. General Practice, however, is under huge time and resource pressures[56]. Any proposed alternatives will have to fulfil the primary requirements of being a streamlined process for supporting coordination of care, especially for those with complex health needs. The recent national review of QOF concluded that QOF should be reformed to become more person-centred, create space for professionalism and optimally impact wider population health and system resource utilisation[57].

FIGURE LEGENDS

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see Supplementary File 4).

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DATA SHARING STATEMENT

All data relevant to the study are included in the article or uploaded as supplementary information.

COMPETING INTERESTS

None declared.

ETHICS AND FUNDING

Ethical clearance was obtained from the Plymouth University Ethics Committees (FREC). All participants were given an information pack about the study, and gave informed consent.
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CONTRIBUTIONS

J Close corresponded with partaking practices, collected data, analysed data and compiled manuscript.

B Fosh input, validated and analysed data.

H Wheat corresponded with partaking practices and collected data.

J Horrell corresponded with partaking practices and collected data.

W Lee supported the Interrupted Time Series analysis.

R Byng aided study design and conception.

Bainbridge M corresponded with partaking practices and data collection.

L Witts helped with study design, data collection and corresponded with partaking practices.

R Blackwell collected and analysed data for Hospital Episode Statistics.

L Hall corresponded with partaking practices and collected data.

Lloyd H designed and oversaw the study from inception to completion.

All authors read, contributed to and approved the manuscript.

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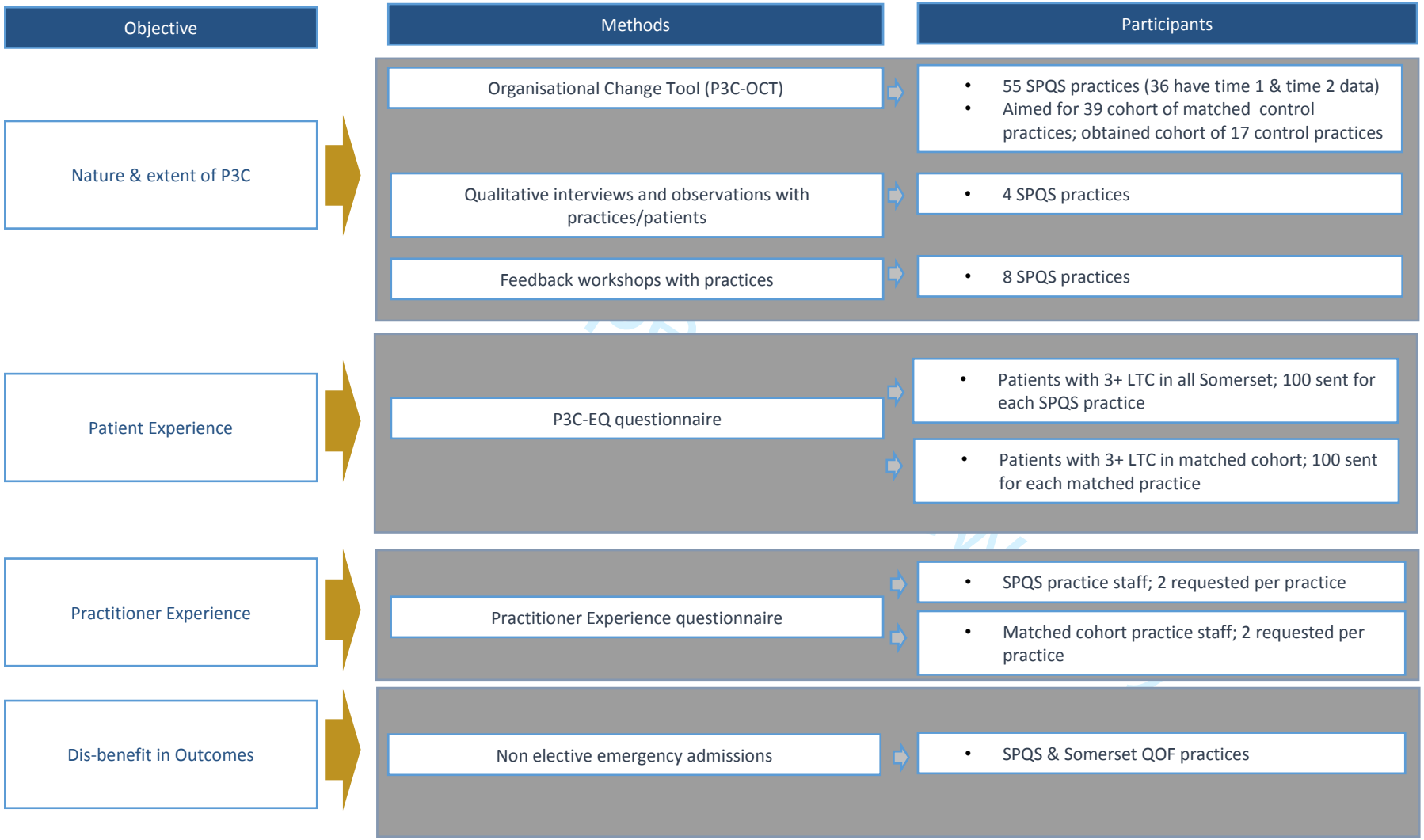
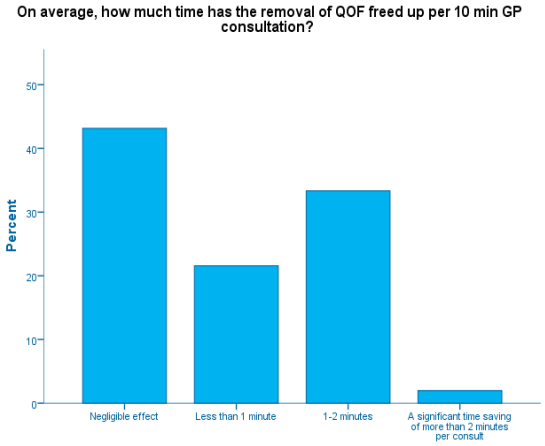
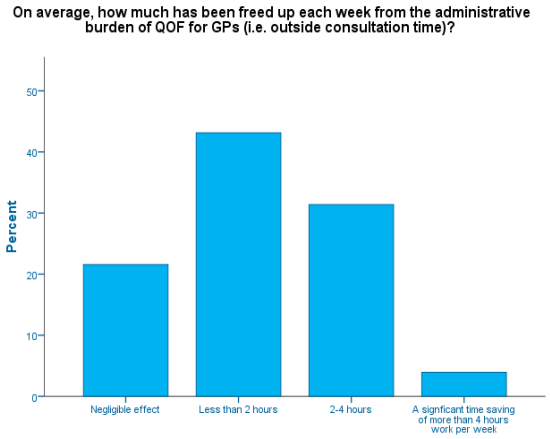
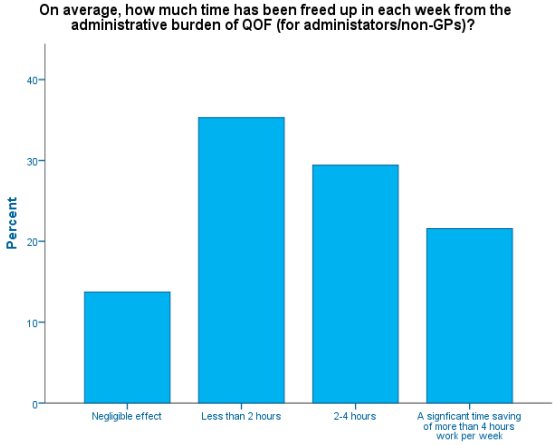
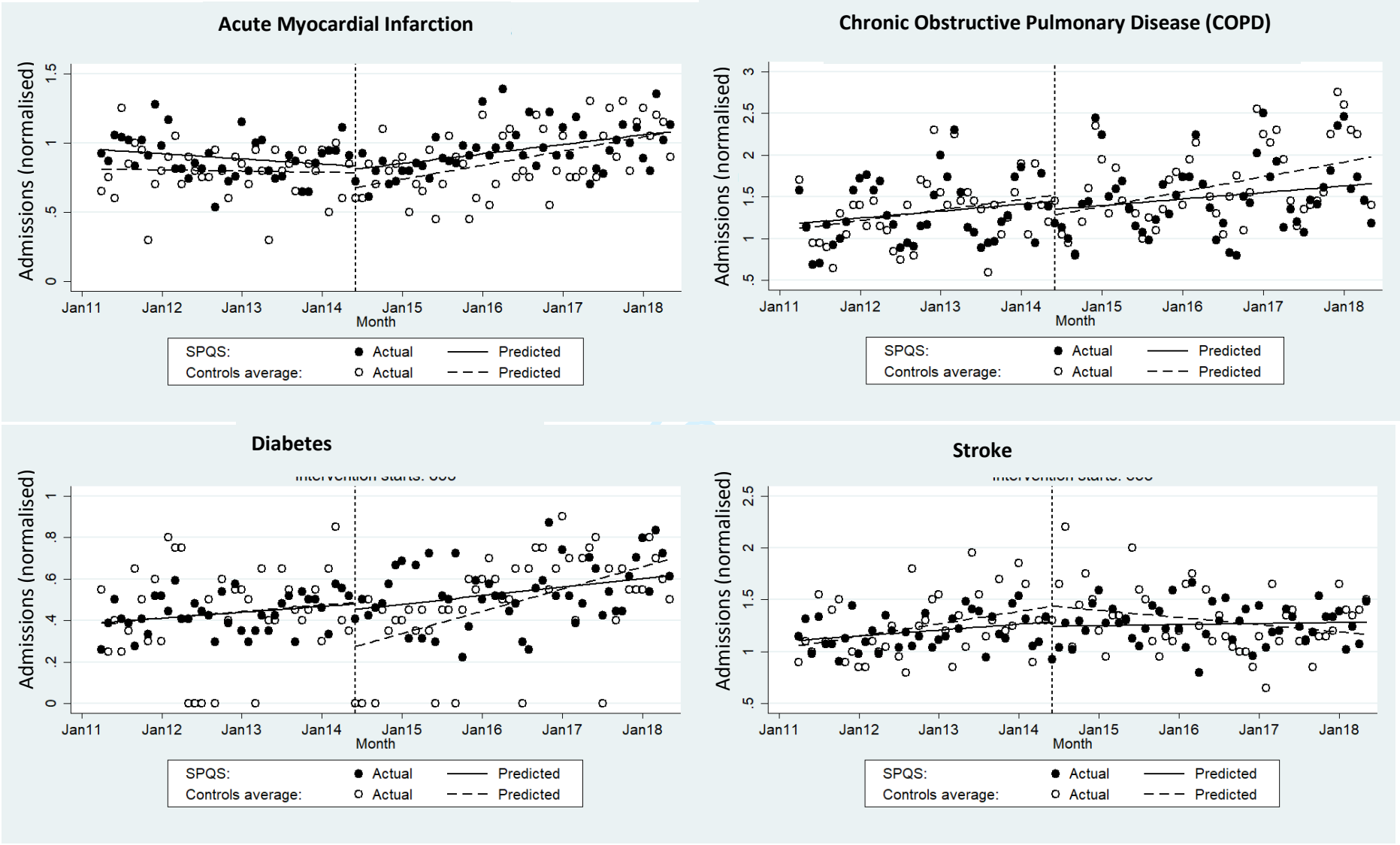

Objective
Methods
Participants
Nature & extent of P3C
Organisational Change Tool (P3C-OCT)
55 SPQS practices (36 have time 1 & time 2 data)
Aimed for 39 cohort of matched control practices; obtained cohort of 17 control practices
Qualitative interviews and observations with practices/patients
4 SPQS practices
Feedback workshops with practices
8 SPQS practices
Patient Experience
P3C-EQ questionnaire
Patients with 3+ LTC in all Somerset; 100 sent for each SPQS practice
Patients with 3+ LTC in matched cohort; 100 sent for each matched practice
Practitioner Experience
Practitioner Experience questionnaire
SPQS practice staff; 2 requested per practice
Matched cohort practice staff; 2 requested per practice
Dis-benefit in Outcomes
Non elective emergency admissions
SPQS & Somerset QOF practices







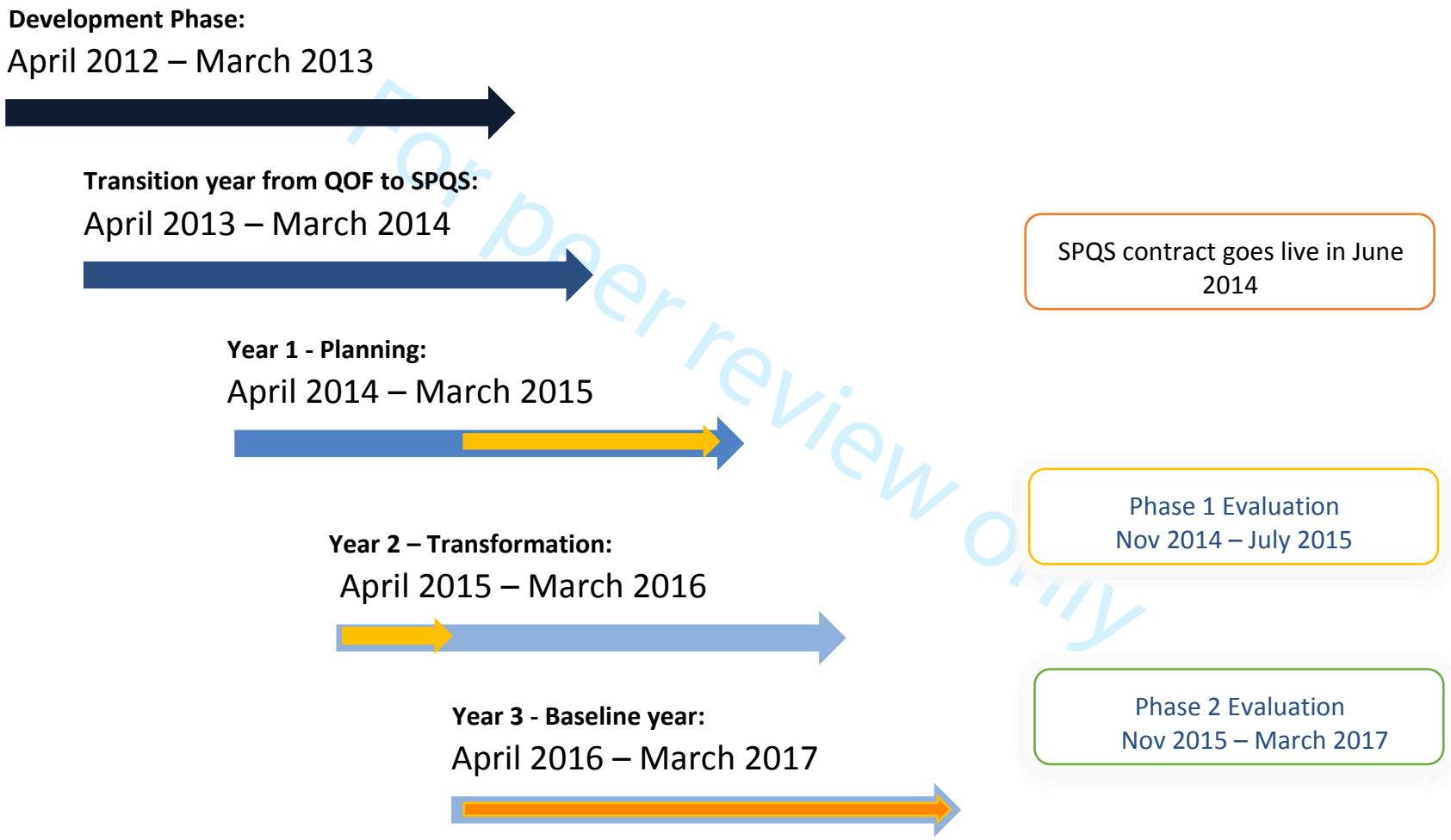

Acute Myocardial Infarction
Admissions (normalised)
0
.5
1
1.5
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Chronic Obstructive Pulmonary Disease (COPD)
Admissions (normalised)
.5
1
1.5
2
2.5
3
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Diabetes
Admissions (normalised)
0
.2
.4
.6
.8
1
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Stroke
Admissions (normalised)
.5
1
1.5
2
2.5
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted

Supplementary File 1: Overview of Sustainability and Transformation Plan (STPs) for 28 of 55 practices enrolled in SPQS; with 2 further STPS (Taunton federation and West Somerset) completed at federation level.

Development area	East Mendip			West Mendip					Central Mendip			North Sedgemore		Bridgwater Bay
	Beckingdon	Frome	Mendip County	Glastonbury Health	Glastonbury Surgery	Vine	Wells City	Wells Health	Grove House	Oakhill	Park Medical	Axbridge & Wedmore	Brent & Burnham	North Petherton
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Continued/increased involvement in Mendip Your Health & Wellbeing	✓					✓		✓	✓		✓			
Use/development of technology to assist self-management		✓		✓										
Increased use of Health Connectors Mendip		✓				✓			✓	✓				
Investing time in community engagement		✓												
MDTs in care coordination hubs		✓												
MDTs with district nurses at palliative care reviews (weekly)		✓												
Engagement in compassionate communities and network mapping		✓												
Increased or continued participation with Symphony				✓		✓	✓	✓	✓		✓			
Possible division of urgent and routine care & formation of urgent care hub				✓		✓		✓				✓	✓	
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)		✓	✓	✓				✓	✓		✓		✓	
Consideration of practice merger				✓		✓	✓	✓	✓					
Training & upskilling									✓					
Engagement in Somerset together programme											✓			
Development of personalised care planning											✓			
Telephone consultations/ telemedicine														
Use of health coaches														
Engagement in Living Better programme														

Development area	South Somerset														Taunton Federation	West Somerset
	Bruton	Illchester	Buttercross	Yeovil	Crewkerne	Hamdon	Oaklands	Ryalls Park	Hendford Lodge & Abbey	Wincanton	Westlake	Martock & S. Petherton	Penn Hill	Preston Grove		
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	✓	✓	✓									✓	✓	✓	✓	✓
Continued/ increased involvement in Mendip Your Health & Wellbeing																
Use/development of technology to assist self-management															✓	
Increased use of Health Connectors Mendip																
Investing time in community engagement												✓				
MDTs in care coordination hubs																
MDTs with district nurses at palliative care reviews (weekly)																
Engagement in compassionate communities and network mapping																
Increased or continued participation with Symphony					✓	✓	✓				✓		✓	✓		
Possible division of urgent and routine care & formation of urgent care hub																✓
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)	✓	✓	✓	✓		✓			✓	✓			✓			✓
Consideration of practice merger											✓					✓
Training & upskilling	✓	✓	✓	✓												
Engagement in Somerset together programme																
Development of personalised care planning																
Telephone consultations/ telemedicine	✓	✓														
Use of health coaches	✓	✓				✓		✓	✓	✓		✓	✓	✓		
Engagement in Living Better programme																✓

Supplementary File 2: Timeline of SPQS scheme and evaluation.



1

Full results of P3C-Practitioner questionnaire

Selection of P3C-Practitioner

The P3C-practitioner was selected for this study by initially conducting a scoping review to identify measures that included aspects of professional experiences of integrated/coordinated care. This identified 33 measures, four of which were deemed relevant (Safety Net Medical Home Provider Experience Survey; Person-Centred Health Care for Older Adults Survey" (PCHCOA) – which we refer to as the "P3C-practitioner"; Staff Questionnaire - Integrated Care Evaluation Pilots; North West London Integrated Care Pilot - Practitioner Survey). These measures were then presented to workshop attendees (healthcare professionals; managers; senior NHS England representatives; local commissioners; academics) to explore the strengths and weaknesses in terms of applicability and utility as part of routine data collection in respective settings. The PCHCOA was selected due to its established psychometric properties (Briony Dow et al., *Development and initial testing of the Person-Centred Health Care for Older Adults Survey*, 25 *International Psychogeriatrics* 1065–1076 (2013)), its good coverage of domains of P3C and a positive response at the feedback workshop. For the purposes of this evaluation, we have renamed the instrument the P3C-practitioner.

Scoring of P3C-Practitioner

Whilst previously validated, the authors did not develop an aggregate scoring mechanism for the instrument. Therefore, we generated summary scores by simple addition from the 4-point Likert scale (Never = 0; Rarely = 1; Sometimes = 2; Usually = 3; Always = 4). This allowed us to compare aggregate scores to compare SPQS versus controls over all 29 questions (see table below), with significance tested using MWW test. We also generated sub-scales by addition of question relevant to this aspect of P3C (see following page for questions). No significant differences were detected in practitioner experiences in SPQS or control practices, for either mean scores or the following subscales.

Sub-Scale: Person Centred Care = Questions 1.1, 1.3, 1.4, 2.1, 2.2, 5.1, 6.1,6.2,6.3, 7.1, 7.2, 7.3, 8.1 8.2 and 8.3.

Sub-Scale: Coordinated Care = Questions 4.1, 4.2, 4.3

Sub-Scale: Working Environment = Questions 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7

	QOF	SPQS	Sig. (2-tailed)
Mean Score	**83.79 (n=29)**	**86.18 (n=98)**	**.4**
Sub-Scale: Person Centred Care	47.62	49.11	.35
Sub-Scale: Coordinated Care	7.41	8.38	.12
Sub-Scale: Working Environment	22.03	21.11	.24

P3C-Practioner instrument

Q1.1 In my work area, service users / patients have an equal say with the rest of the team in the development of the support plan.

Q1.2. In my work area, service users / patients and carers have an equal say with the rest of the team in the development of the discharge plan or exit strategy from the service.

Q1.3. My/our support plans are structured around the service user's/patient's goals.

Q1.4. Where I currently work, we provide services in the location that best suits the needs and preferences of the service user/patient and their carers.

Q2.1. I ask service users/patients what their goals/needs are for their health and wellbeing.

Q2.2 I ask the carer/s what their goals/ needs are for the health and wellbeing of the person they support.

Q3.1. I am supported to develop the skills I need to work with the service user/patient and their carers.

Q3.2. Where I am currently working, I have been exposed to good role models in care/support for service users/patients.

Q3.3. Expectations of my role and how I treat the service users/patients I support are communicated clearly and consistently.

Q3.4. I feel that I work as part of a team with a recognised and valued contribution.

Q3.5. The emotional and physical demands of my work are acknowledged and recognised.

Q3.6. I feel that I am able to fully use my skills in my work with the service users/patients

Q3.7. My work environment values the care/support I provide to the service users/patients.

Q4.1. It is clear to the service user/patient or their carer who their key worker is.

Q4.2. The service user/patient and their carer have ready access to a key identified person (i.e. they are available by phone, messages are returned promptly).

Q4.3. Where I currently work, we know how to direct the service user/patient to the most appropriate service without them having to make another call (single point of contact).

Q4.4. After the service user/patient is discharged/leaves the service, they receive a follow-up phone call or visit.

Q5.1. Where I currently work, adequate transport and parking are provided to ensure access for service users/patients and their families/carers.

Q5.2. Where I currently work, service users'/patients' personal privacy is respected.

Q6.1. I am able to meet the communication needs of service users/patients and their carers when working with them.

Q6.2. Written materials are provided by my place of work to service users/patients and their carers in a language they can understand.

Q6.3. Information is provided in a variety of ways to ensure all service users/patients and their carers have access (e.g. written, verbal, visual).

Q7.1. I welcome it when service users/patients are informed and question or challenge my advice.

Q7.2. The needs and preferences of service users/patients should be central in all services.

Q7.3. I like working with the service users/patients I support or care for.

Q8.1. It is an important part of my job to get to know my service user/patient (e.g. call them by their preferred name, remember and repeat something they have told me).

Q8.2. I give service users and their carers adequate time to talk to me (e.g. to discuss their concerns and their expectations).

Q8.3. I seek to find out what is important to service users/patients about their health and wellbeing (e.g. mobility, cognitive function, being part of the family, able to go to the gym).

Supplementary File 4: Results of interrupted time-series analysis for emergency admissions on four long-term, ambulatory care sensitive conditions (ACSCs). Full results are provided, although the most relevant statistical tests (column "P>|t|") are for the rows:

"_z_x659" the difference between the changes in intercept for SPQS and QOF pre/post intervention)

"_z_x_t659" the difference between the changes in gradient for SPQS and QOF pre/post intervention.

All are non-significant, revealing no excess increases in emergency admissions in SPQS practices for these four ACSCs after the implementation of the SPQS scheme. Significant differences were observed, however, for changes in the *control* slope and/or intercept pre/post intervention for Acute Myocardial Infarction, Stroke and Diabetes . These are highlighted in red below.

Acute Myocardial Infarction (AMI)

		Newey-West				
Description	**PRIM_AMI**	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**
Pre-intervention control gradient	_t	-.0007003	.0025541	-0.27	0.784	-.0057435 .0043429
Difference between control/SPQS pre-intervention intercepts	_z	.1396686	.0801094	1.74	0.083	-.0185102 .2978475
Difference between control/SPQS pre-intervention slopes	_z_t	-.0024182	.0034503	-0.70	0.484	-.009231 .0043946
Change in control intercept	_x653	-.1043759	.0677199	-1.54	0.125	-.2380911 .0293393
Change in control slope	**_x_t653**	**.0091594**	**.0030779**	**2.98**	**0.003**	**.0030819 .0152369**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.0853708	.0946241	0.90	0.368	-.1014677 .2722093
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0003106	.0040914	-0.08	0.940	-.0083892 .0077679
Intercept of control pre-intervention	_cons	.8103239	.0652408	12.42	0.000	.6815037 .9391441

Chronic Obstructive Pulmonary Disease (COPD)

Description	PRIM_COPD	Newey-West Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0105427	.0048903	2.16	0.033	.0008867	.0201988
Difference between control/SPQS pre-intervention intercepts	_z	.0619958	.1748488	0.35	0.723	-.2832492	.4072408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0035803	.0077243	-0.46	0.644	-.0188323	.0116717
Change in control intercept	_x653	-.2382072	.1889151	-1.26	0.209	-.6112265	.1348121
Change in control slope	_x_t653	.0041691	.0078257	0.53	0.595	-.011283	.0196211
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.1413474	.2797523	0.51	0.614	-.4110331	.693728
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0046434	.011329	-0.41	0.682	-.0270129	.0177261
Intercept of control pre-intervention	_cons	1.122065	.1089517	10.30	0.000	.9069359	1.337194

Stroke

Description	PRIM_STRK	Newey-West Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0100503	.0041188	2.44	0.016	.0019176	.0181831
Difference between control/SPQS pre-intervention intercepts	_z	.0528715	.0954745	0.55	0.580	-.1356461	.2413891
Difference between control/SPQS pre-intervention slopes	_z_t	-.0053472	.0047727	-1.12	0.264	-.014771	.0040765
Change in control intercept	_x653	-.0003719	.1374057	-0.00	0.998	-.2716843	.2709404
Change in control slope	**_x_t653**	**-.0158336**	**.005394**	**-2.94**	**0.004**	**-.0264841**	**-.005183**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	-.0449425	.1616696	-0.28	0.781	-.3641647	.2742798
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0119868	.0062141	1.93	0.055	-.0002831	.0242568
Intercept of control pre-intervention	_cons	1.05749	.0852406	12.41	0.000	.8891793	1.2258

Diabetes

Description	PRIM DIAB	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0025823	.0026916	0.96	0.339	-.0027323	.0078969
Difference between control/SPQS pre-intervention intercepts	_z	.0005698	.0759019	0.01	0.994	-.1493012	.1504408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0001994	.0029745	-0.07	0.947	-.0060726	.0056738
Change in control intercept	**_x653**	**-.2114749**	**.0751425**	**-2.81**	**0.005**	**-.3598463**	**-.0631036**
Change in control slope	_x_t653	.0063408	.0033715	1.88	0.062	-.0003164	.012998
difference between the changes in intercept for SPQS and QOF pre/post intervention	**_z_x653**	**.1864524**	**.0866148**	**2.15**	**0.033**	**.0154285**	**.3574763**
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0052892	.0038335	-1.38	0.170	-.0128586	.0022802
Intercept of control pre-intervention	_cons	.3890688	.0704267	5.52	0.000	.2500088	.5281288

Combined (AMI/COPD/Stroke/Diabetes

Description	SECD_AMI	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0224751	.0064245	3.50	0.001	.0097898	.0351604
Difference between control/SPQS pre-intervention intercepts	_z	.2551058	.227217	1.12	0.263	-.193542	.7037535
Difference between control/SPQS pre-intervention slopes	_z_t	-.0115452	.009923	-1.16	0.246	-.0311385	.0080482
Change in control intercept	**_x653**	**-.5544301**	**.2489365**	**-2.23**	**0.027**	**-1.045964**	**-.0628964**
Change in control slope	_x_t653	.0038357	.0103935	0.37	0.713	-.0166866	.024358
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.3682284	.3741294	0.98	0.326	-.3705031	1.10696
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0017436	.0148231	0.12	0.907	-.0275252	.0310124
Intercept of control pre-intervention	_cons	3.378947	.1531439	22.06	0.000	3.07656	3.681335

STROBE Statement—checklist of items that should be included in reports of observational studies

	PAGE/LINE NUMBER IN MANUSCRIPT	Recommendation
Title and abstract	p2	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	P3-5	Explain the scientific background and rationale for the investigation being reported
Objectives	L126-132	State specific objectives, including any prespecified hypotheses
Methods		
Study design	L135-145	Present key elements of study design early in the paper
Setting	Setting L135-145; dates L210-217	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	L148-168	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	L169-198	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	L169-198	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	L158-161	Describe any efforts to address potential sources of bias
Study size	L149-151	Explain how the study size was arrived at

Quantitative variables	L209-235	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	L209-235	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	L239-247	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	Table 1	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	L239-282	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	L239-357	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	N/A	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	L360-397	Summarise key results with reference to study objectives
Limitations	L405-413	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	N/A	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	N/A	Discuss the generalisability (external validity) of the study results
Other information		
Funding	L451-6	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

A Longitudinal Evaluation of a Countywide Alternative to the Quality and Outcomes Framework in UK General Practice, Aimed at Improving Person Centred Coordinated Care.

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Complete List of Authors:	Close, James; University of Plymouth, Community and Primary Care research group Fosh, Ben ; University of Plymouth, Community and Primary Care Research Group Wheat, Hannah; University of Exeter, Sociology, Philosophy and Anthropology department Horrell, Jane; University of Plymouth, Community and Primary Care Research Group Lee, William; University of Plymouth, Community and Primary Care research group Byng, Richard; University of Plymouth, Peninsula Schools of Medicine and Dentistry Bainbridge, Michael ; NHS Somerset Clinical Commissioning Group Blackwell, Richard; South West Academic Health Science Network Witts, Louise; South West Academic Health Science Network Hall, Louise; South West Academic Health Science Network Lloyd, Helen; University of Plymouth, Psychology
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A Longitudinal Evaluation of a Countywide Alternative to the Quality and Outcomes Framework in UK General Practice, Aimed at Improving Person Centred Coordinated Care.

Close, James james.close@plymouth.ac.uk

Corresponding author.

University of Plymouth, Community and Primary Care research group
ITTC Building
Davy Road, Plymouth Science Park
Derriford, Plymouth
Plymouth, UK PL6 8BX
01752 764260

Fosh, Ben Ben.fosh@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW
07860593505

Wheat, Hannah H.Wheat@exeter.ac.uk

University of Exeter, Sociology, Philosophy and Anthropology department
Exeter, UK

Horrell, Jane jane.horrell@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW
01752 764260

Lee, William william.lee@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW

Byng, Richard richard.byng@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW

Bainbridge, Michael Michael.Bainbridge@somersetccg.nhs.uk

NHS Somerset Clinical Commissioning Group
Yeovil, Somerset, UK

Blackwell, Richard Richard.Blackwell@swahsn.com

South West Academic Health Science Network
Exeter, UK

Witts, Louise Louise.Witts@swahsn.com

South West Academic Health Science Network
Exeter, UK

Hall, Louise Louise.Hall@swahsn.com

South West Academic Health Science Network
Exeter, UK

Lloyd, Helen helen.lloyd-1@plymouth.ac.uk

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Evaluation of a Countywide Alternative to the Quality Outcomes Framework, Aimed at Improving Person Centred Coordinated Care.

Abstract

Objectives.

To evaluate a county-wide deincentivisation of the Quality and Outcomes Framework (QOF) payment scheme for UK General Practice (GP).

Setting

In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups. Fifty-five GP practices in Somerset established the Somerset Practice Quality Scheme (SPQS) – a de-incentivisation of QOF – with the goal of redirecting resources towards Person Centred Coordinated Care (P3C), especially for those with Long Term Conditions (LTCs). We evaluated the impact on processes and outcomes of care from April 2016 to March 2017.

Participants & Design

The evaluation used matched data from 55 SPQS practices and 17 regional control practices for three survey instruments. We collected patient experiences ('P3C-EQ'; 2363 returns from patients with 1+ LTC; 36% response rate), staff experiences ('P3C-practitioner'; 127 professionals), and organisational data ('P3C-OCT'; 36 of 55 practices at two time points, 65% response rate; 17 control practices). Hospital Episode Statistics emergency admission data were analysed for 2014-2017 for ambulatory-sensitive conditions across Somerset using interrupted time series.

Results

Patient and practitioner experiences were similar in SPQS versus control practices. However, discretion from QOF incentives resulted in time savings in the majority of practices and practice data showed a significant increase in P3C oriented organisational processes, with a moderate effect size (Wilcoxon signed rank test; p=0.01; r=0.42). Analysis of transformation plans and organisational data suggested stronger federation-level agreements and informal networks, increased multidisciplinary working, reallocation of resources for other health care professionals and changes to the structure and timings of GP appointments. No disbenefits were detected in admissions data.

Conclusions

The SPQS scheme leveraged time savings and reduced administrative burden via discretionary removal of QOF incentives, enabling practices to engage actively in a number of schemes aimed at improving care for people with LTCs. We found no differences in the experiences of patients or healthcare professionals between SPQS and control practices.

Article Summary

Strengths and limitations of this study

- This study evaluated changes to service delivery, conducted using two survey tools – offering a perspective on the experiences of both patients and healthcare professionals.
- These were supplemented with a longitudinal analysis of organisational change (to measure alterations to service deliver) and a time-series of emergency admissions for ambulatory-sensitive conditions (to detect disbenefits arising from the scheme).
- Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region.
- No detectable improvements were established in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, or changes to patient/practitioner experiences were somewhat distal to the intervention.

Main Text

BACKGROUND

The Quality and Outcomes Framework (QOF) for UK General Practice (GP) is one of the largest health-related pay-for-performance (P4P) schemes in the world[1]. Following implementation in 2004, the scheme initially had a positive impact on quality of care, primarily achieved via establishment of consistent procedural baselines in the clinical management of incentivised (mostly chronic) diseases[1–5]. It reduced between-practice inequalities in care delivery[1–3] whilst also leading to improved disease registers, widespread recording of clinical activities and adoption of electronic medical record systems[1], leading to growth in GP data and related research[6,7].

Since the introduction of QOF, demographic shifts of an ageing population have continued to drive a shifting clinical landscape[8], with the number of people with three or more long-term conditions (mLTCs) thought to have risen by one million over the last decade[9]. The subsequent rising demand for the management of long term conditions (LTCs) and mLTCs – requiring tailored and coordinated support[10,11] – has led to QOF (with its emphasis on processes for single disease guidelines) being viewed as increasingly anachronistic[6,12–16]. After introduction of QOF, there was a significant reduction in the continuity of care[2,17] and the person-centeredness of GP consultations[13,14,18,19], with a subsequent decline in patients' satisfaction[20]. It has been argued that QOF does not incentivise appropriate clinical care for people with multimorbidity[6,12–16], who require individualised support, greater continuity of care and a holistic, biopsychosocial approach that is responsive and empowering[10,11]. An oft-quoted criticism is that QOF reduces consultations to a 'box-ticking' exercise[21].

In response to such criticisms, both the NHS Chief Executive and the General Practitioners Committee (GPC) Chairman previously backed the removal of QOF[21] and In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups (CCGs), allowing organisations the freedom to develop alternatives. Potential advantages included the targeting of local health needs

and greater clinical engagement for quality improvement[22]. In response, the Somerset Practice Quality Scheme (SPQS) was established as a de-incentivisation of QOF. It arose because GPs, the CCG and the Local Medical Committee (LMC) felt that QOF was not incentivising the highest value clinical behaviour. The goal was to allow clinicians the freedom to innovate, enable consultations to be more person-centred and increase involvement with a number of concurrent schemes aimed at improving Person Centred Coordinated Care (P3C)[23]. The details of the scheme were included in the SPQS contract[24] and local Sustainability and Transformation Plan (STPs – Plans for reforming healthcare mandated by the Five Year Forward View[25]) of the GPs[26]. (See Supplementary File 1 for a summary of Somerset STPSs; box 1 for brief details of the various schemes and references for details). The contract removed incentives from QOF, although CQRS (Calculating Quality Reporting System) remained active in order to collect prevalence data for payment calculations. The SPQS contract stated that the reduced QOF overhead would be exploited to better meet the needs of patients with long term conditions by developing new models of care. Implementation was specified in the locality STPs, which included a patchwork of initiatives, most notably the 'Test and Learn pilots', which encompassed three distinct schemes (box 1), all of which had a shared vision of targeting complex patients with care plans, multidisciplinary team input (MDT) and single point of contact [27,28] . Other schemes included a Village Agents service[29] and Health Connections Mendip (HCM)[30] – see box 1. Fifty five Somerset practices opted for SPQS, with 18 Somerset practices (initially 20) retaining the existing QOF contract. (The SPQS practices increased to 57 in 2015/16; but two mergers reduced it back to 55).

Test & Learn: Comprises three similar initiatives (South Somerset Symphony Vanguard, Taunton, and Mendip – see below), which share a common goal of targeting complex, multimorbid patients with a suite of approaches including single personalised care plans, multi-disciplinary team input and single point of access to provide person centred coordinated care.

> **Test & Learn – South Somerset Symphony Vanguard**: A symphony "hub" system located at Yeovil District Hospital, where complex patients receive extra support from Health Coaches/Key Workers at the Symphony hub service, although they remain under management of GP practice [27,28].
>
> **Test & Learn – Taunton:** Operates under a "virtual hub" model, with complex/frail patients managed by a multidisciplinary team moving between practices, with shared care plans and Wellbeing Advisors.
>
> **Test & Learn – Frome Mendip, including "Health Connections Mendip".** With loose eligibility criteria and a number of referral routes, Community Practice Nurse and Health Connectors (based at Frome) liaise regularly in MDT meetings. There is a hub telephone line for single point of access. The model advocates utilising existing assets in the community. The Health Connections team lead social prescribing work with a service directory to signpost patients to appropriate resources [30].

Enhanced Primary Care (EPC): EPC is a sub-component of the Symphony vanguard scheme that incorporates health coaches (HCs) into primary care, focusing on less complex patients, allowing GPs to focus primarily on medical problems.

Village Agents Service: Supports isolated, excluded and vulnerable (including elderly and multimorbid) people by offering a signposting and referral service. The service links with general practices [29].

Living Better: A working partnership between the GP practices, AGE UK Somerset, Social Care, Somerset Partnership, West Somerset District Council, and Somerset Clinical Commissioning Group. The project supports people with one or more long-term conditions to better self-manage, helping them build connections to the community and reducing dependency on health and social care.

Box 1. Initiative for implementation of SPQS.

The initial phase of the scheme was previously evaluated with a retrospective approach[31]. This revealed early stages of organisational change, including stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources towards health care assistants, nurses and others, and changes to structure and timings of appointments with GPs. From April 2016 to March 2017 we conducted a longitudinal evaluation of the second full year of the SPQS programme (see Supplementary File 2 for a timeline of the SPQS scheme and associated evaluations). This was commissioned with the aims of establishing the nature and extent of P3C that

has been implemented since discretion from QOF, explore staff and patient experiences of care delivery and examine non-elective hospital admissions before and after inception of the scheme.

METHODS

We conducted a mixed-methods evaluation of SPQS which included a suite of quantitative and qualitative tools. Analysis of quantitative data is described in this paper. In-depth qualitative findings will be published in a subsequent paper (including semi-structured interviews with practitioners; observations of consultations and facilitation workshops with practices). A schematic overview of the full SPQS evaluation framework is provided in figure 1. The quantitative evaluation included completion of survey tools targeting patient experiences (P3C-EQ), staff experiences (P3C-practitioner) and organisational perspectives (P3C-OCT tool), alongside time series of Hospital Episode Statistics (HES) for ambulatory-sensitive conditions across Somerset. We chose not to use national measures of General Practice (i.e. GP Patient Survey (GPPS) and Friends and Family Test (FFT)): they have a broad sample and do not target the patient group (i.e. patients with LTCs) that are the focus of SPQS. Furthermore, they do not target the construct of interest (i.e. P3C).

<figure 1 here>

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Samples

The 55 participating Somerset practices (mean list size = 7,695; median = 6515.5; smallest = 1834; largest = 29,078) completed our evaluation tools (see below). Whilst these 55 practices were incentivised to take part in our evaluation (i.e. by being part of SPQS), the non-SPQS Somerset practices had no incentive to act as controls and did not participate in this study. Therefore, for control practices, we initially identified a cohort of non-Somerset control practices matched for staffing data, list size, population density, indices of multiple deprivation, QOF scores and disease prevalence. However, the incentives available for this evaluation (£200 per practice) were only sufficient to recruit six practices by this method. We therefore supplemented this group with 11 unmatched practices from across the Southwest, making a total of 17 control practices (mean list size = 6,714; median = 4878; smallest =2678; largest = 4878). The control group therefore represents a self-selected sample of practices that are likely to represent engaged, active practices (i.e. with the resources to engage with research). In contrast, completion of our evaluation was mandatory for all SPQS practices.

Patient and Public Involvement

Patients were involved via the peninsula CLAHRC patient involvement group (PenPig), who set priorities for research objectives. Patients, public and healthcare professionals were also involved in co-design workshops to develop the measurement framework and individual questionnaires (see papers for details [23,32–37]). Patients also reviewed drafts of ethics approval applications and all patient-facing communication. The work was co-presented with patients at the South West Society for Academic Primary Care Regional Meeting 2018.

Survey Tools

The P3C-Patient Experience Questionnaire (P3C-EQ) is a brief, 11-item patient-completed measure of patient experiences of person centred coordinated care delivery, which we have previously

validated[32,38,39]. The tool can be used to generate an aggregate score of patient experience[32], with a range of score from 0-30, where a higher score indicates better experiences of care [39]. It can also be sub-scored to previously described sub-domains of P3C[23,32,34–37].

The P3C-Practitioner Experience Survey is a 29-item instrument that measures individual and managerial experience of delivering person centred and coordinated care. Via a workshop with healthcare professionals, we selected the previously validated P3C-Practitioner questionnaire (also known as the Person-Centred Health Care for Older Adults Survey[40]) as the most suitable instrument to examine practitioners' perspectives of P3C (see Supplementary File 3). A minimum of two practitioners from each practice were requested to respond. The instrument generates an aggregate score with a range of 29-145, where a higher score indicates better experiences of care.

The P3C-Organisational Change Tool (P3C-OCT) is an evidenced-based measure of progress towards delivering person centred coordinated care from an organisational perspective[33]. It was developed to support and measure P3C in line with Year of Care[34] and RCGP principles of Collaborative Care and Support Planning[41], thus providing a way to monitor changes in line with policy directives which improve P3C. The tool was designed to measure all core P3C routines which have been identified through research[42,43], patients' accounts, policy documents[34] and our own work[23,33]. The design of the P3C-OCT is based on a shared consensus of the components of person-centred coordinated care (e.g. [35,36,44]), which broadly correspond to six domains: Information and Communication; Care Planning; Goals and Outcomes; Transitions; Organisational Process Activities; and Decision Making. These domains have been mapped to real-world actions that support the delivery of P3C (e.g. multi-disciplinary team meetings, care planning, provisions for information etc.) This allows the tool to translate concepts which are often abstract, and may be drawn from academic literature and policy documents, into actionable, tangible processes which a practice can implement. The result is a unique 29-question instrument with over 500 different possible responses, which provides a detailed and practical interrogation of P3C delivery. An equally-weighted scoring system allows results of the P3C-OCT to be aggregated into a single composite score, or alternatively by sub-domains of P3C – generating a score of 0-20, with higher scores indicating more P3C related activity.

The P3C-OCT provides a detailed profile of care delivery and organisation through 29 core questions. All questions ask about objective activities (e.g. processes in place to deliver P3C) and subjective responses (e.g. how well these are working). Scores are given out of a theoretical maximum of 20 points. The P3C-OCT was also prepended by a series of SPQS-related questions about administrative and consultation time savings from discretion from QOF. Each SPQS practice was requested to complete the P3C-OCT at two time points (from Feb-Aug 2016 and Dec 2016-Mar 2017). In contrast, control practices only completed the P3C-OCT once (at Time 2).

Data Collection

All participating practices supported data collection of the three survey tools. With the P3C-EQ, from each practice, 100 patients with one or more LTCs, randomly sampled from the practice list (using a customised EMIS script), were invited to complete a postal questionnaire at a single time point. Patients received an information pack, consent sheet, demographic questionnaire and P3C-EQ. All returned questionnaires were entered into a Microsoft Access database prior to statistical analyses. For the P3C-Practitioner, we obtained an opportunity sample via both written and email communication with all participating practices. For the P3C-OCT, all participating practices were

offered an electronic or paper version, and we requested that the tool was completed by a combination of General Practitioner and Practice Manager (PM), thus ensuring representation of front-facing and backend operations of GP surgeries. Completion of the tool was mandatory as part of the SPQS evaluation.

Analysis

SPQS and control practices were compared on the P3C-Patient Experience survey and the P3C-Practioner Experience Survey (at time 2; 6-12 months after initiation of second year/phase 2 of SPQS), with significance tested using the non-parametric unmatched Mann–Whitney–Wilcoxon (MWW) test taking into account within-practice clustering by calculating Somers' D statistic (non-parametric tests were used, as the scoring is a summation of Likert responses i.e. data was ordinal). For the P3C-Organisational Change Tool, we compared Time 1 (immediately after implementation of second year/phase 2 of SPQS) and Time 2 (6-12 months later), with significance evaluated by Wilcoxon signed rank test.

Time Series of emergency admissions to hospital

A multi-group interrupted time-series analysis (ITS) was conducted to identify whether de-incentivisation of QOF and the introduction of SPQS was associated with changes in emergency admissions to acute hospitals with a primary diagnoses for four long-term, ambulatory care sensitive conditions (ACSCs). Hospital episode statistics were obtained for patients from all 55 GP practices enrolled in the SPQS scheme (actually 56 practices in 2015/15) and 18 Somerset QOF practices (i.e. Somerset practices not enrolled in SPQS; initially 20). Data was obtained for a 70 month period from April 2011 to May 2018. This time period is divided into 38 months pre-intervention (Apr 2011 – May 2014) and 48 months post intervention (June 2014 – May 2018; SPQS contract went live in June 2014, month 39). Data include monthly admission counts for four ACSCs: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes, and Stroke. We selected these ACSCs as a proxy for preventable admissions and an indicator of any deteriorating quality of care associated with SPQS. Due to the difference in number of practices between SPQS and QOF practices, admissions were divided by the number of practices, thus providing an average of emergency admissions (expressed as admissions per month per practice). Analysis was performed using the *itsa* command[45] on STATA (StataCorp Ltd). This uses regression-based model with Newey-West standard errors. Pre- and post-intervention slopes/intercepts of the sample (SPQS practices) were compared to controls (QOF practices). Lag period was set to 1 month.

RESULTS

P3C-EQ

There were 1,752 responses received from 49 (89%) of the 55 practices enrolled in SPQS, and 611 responses from patients enrolled in the 17 control (QOF) practices (36% response rate and similar to other similar other studies[46]). The responses of the two groups compared in Table 1.

Table 1: Demographic profile of responses to P3C-EQ as percentages.

Participant demographics as a percentage										
Age			**Education**			**Gender**			**Multi-morbidity**		
	QOF	SPQS		QOF	SPQS		QOF	SPQS	**No. LTCs**	QOF	SPQS
<=24	0.3	0.4	None	1.0	1.3	Male	44.0	43.4	1	19.6	20.1
25-34	2.5	1.3	Primary	3.1	2.1	Female	53.8	53.9	2	19.6	23.8
35-44	2.5	2.6	Secondary	33.7	34.6	Non-response	2.2	2.7	3	20.6	17.8
45-54	8.8	5.3	College/Vocational	26.4	28.1				4	11.3	13.7
55-64	18.3	13.3	Undergraduate	11.5	10.8				5	9.3	7.5
65-74	25.7	29.2	Postgraduate	8.2	7.8				6	4.7	5.1
75-84	29.3	32.7	Non-response	16.2	15.3				7	2.8	2.8
>=85	12.1	14.1							>=8	4.2	2.8
Non-response	0.5	1.0							Non-response	7.9	6.4

The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1,752) and QOF controls (23.68, n. 611) were not significantly different (MWW U test; *p=0.346*), and indicate generally positive experiences of care across both samples.

P3C-Practitioner results

Full results of the P3C-Practioner are provided in Supplementary File 3. We received 98 responses from 55 SPQS practices and 29 responses from 18 control practices from a mix of healthcare professionals – 62 GPs (49%); 35 Nurses (27%); 12 Wellbeing Advisors; 7 LTC nurse; 11 others. The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1752) and QOF controls (23.68, n. 611) were not significantly different (MWW test; *p=0.405*). Return rates are not applicable, as this was a convenience sample where we requested response from at least two different professionals at each practice.

P3C-OCT Results

To evaluate changes to P3C during the SPQS scheme we undertook an analysis of the organisation and delivery of care using the P3C-OCT. Of 55 practices enrolled in the scheme, 36 practices provided admissible data (i.e. complete and timely) at the two evaluation time-points (Time 1: 2/2016–8/2016 and Time 2 was 12/2016-5/2017; 65% response rate). This revealed an increase (0.9; p=0.034) in aggregate scores on the P3C-OCT between T1 (5.8) to T2 (6.7). This therefore represents a measurable increase in activity towards person centred coordinated care delivery and organisation (see table 2), with a moderate effect size (r=0.42). To determine the specific areas of person centred coordinated care (P3C) that improved during the evaluation, this was examined by domains of P3C[34–36]. When

broken into subdomains of P3C, significant improvements were delivered in areas related to 'Goals and Outcomes' (e.g. goal setting with patients; 1.7 increase, *p*=0.00; large effect size *r*=0.61).

Table 2: Mean changes in P3C-OCT scores between time 1 and time 2 for 36 paired practices. The top row provides the total OCT score (out of a maximum of 20), followed by domains of P3C. The OCT score for each domain is given for time 1, time 2 and the difference between time 1 and 2. The statistical significant of these differences is indicated by *p-value* from Wilcoxon signed rank test. Statistically significant results (at the level p<0.008; corresponding to a Bonferroni adjustment for 6 tests at the p<0.05 significance level) are indicated in bold font and with an asterisk next to the *p*-value. Effect sizes were calculated as test statistic *z* by the square root of the number of pairs.

	Time 1	Time 2	Change T1→ T2 (p-value; effect size)
Total OCT Score:	**5.8**	**6.7**	**0.9 (*p*=0.01; *r*=0.42)***
Information & Communication	7.4	8.1	0.7 (*p*=0.25; *r* =0.19)
Care Planning	6.6	7.2	0.6 (*p*=0.14; *r*=0.25)
Goals & Outcomes	6.1	7.8	**1.7 (*p*<0.001; *r*=0.61)***
Transitions	4.9	5.2	0.3 (*p*=0.43;*r*=013)
Organisational Process Activities	4.3	5.2	0.9 (*p*=0.03;*r*=0.36)
Decision Making	3.8	4.4	0.6 (*p*=0.07;*r*=0.3)

Further to the longitudinal analysis, SPQS practices were also compared to a cohort of 17 non-SPQS practices from the South West (all control practices returned data at Time 2). Aggregate results for the P3C-OCT revealed that control practices had an aggregate score of 6.2 on the P3C-OCT, with no significant difference between SPQS and control practices either before (a score of 5.8 versus 6.2; *p=0.64*) or after (6.7 versus 6.2; *p=0.41*) the intervention.

Discretion from QOF and time savings

When asking SPQS practices to complete the P3C-OCT, we also included a number of additional questions related to the SPQS scheme. We asked SPQS practices a subjective appraisal of time savings (both in GP consultations and administration) from enrolment in the scheme. These are shown in figure 2. More than half (55%) of the practices (28 of 51 practices that completed these questions) agreed that time had been freed up within the 10 minute standard consultation time.

<figure 2 here>

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

With regard to administrative time savings, more than three quarters of SPQS practices (40/51; 78 %) reported administrative (non-consultation time for practitioners) time savings since initiation of the scheme, with just over one third of these practices (14/51; 27%) reporting gains of more than 2 hours per week. For administrators and non-clinical staff, SPQS was reported to free up time for more than 86% (44/51) of practices with only 13 % (7/51) reporting a negligible effect. Free text response boxes confirmed the plans of the STPs (see introduction and Supplementary File 1), stating that efficiency had been leveraged for increased collaborative and federation-level working, including engagement with a number of schemes in Somerset designed to improve person centred and coordinated care e.g. "Better use of Symphony", "Engagement with EPC", "Rural Practice Network", "Health coaches", "Huddles", "P3C relevant training", "Replaced by other work such as Symphony/health coaching etc", "This hasn't shown a reduction in workload but rather a change in workload." In this manner, the time savings leveraged from QOF were not hypothesised to lead to an improvement of experiences for practitioners, but instead a shift in workload.

Retention of QOF elements

When asking SPQS practices to complete the P3C-OCT, we also included a number questions specific to the implementation of SPQS. When asked 'Are you still using components of the QOF?', nearly all practices enrolled in SPQS continued to use at least some aspects of QOF (only 1 out of 51 respondents to this question stated "none"; 86% of practices used "Some", "Most" or "All"). We further investigated the continued utilisation of QOF via a free-text response in the P3C-OCT questionnaire. This revealed that QOF was still (according to one practice) utilised by "applying individually, not 'point scoring'". A common aspect that was dropped was exception reporting, with time also being saved by avoiding "target chasing". Elements of QOF were also contractually retained such as the CQRS (Calculating Quality Reporting System). This remained active under the SPQS contract to allow data on prevalence and key indicators to be collected from practices via GPES (GP Extraction System), where prevalence figures are utilised in the SPQS payments calculation.

QOF also continued to be utilised for the monitoring of LTCs and recall of patients with LTCs for routine check-ups. Around a half of SPQS practices (n=25) still use QOF for recall of at least some (or all) conditions (e.g. checking for recall requirements for patients with LTCs and the management of specific chronic diseases). Free text responses suggested that whilst recall was an essential function, the implementation under QOF was overly burdensome and not tailored for multiple morbidities. Some practices countered this by running in-house developed searches with a priority to "concentrate on an integrated LTC system". This suggests that that there is scope for collaboration to design an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs (as previously proposed[47,48]).

Time Series of Hospital Episode Statistics

Results of the ITS are shown in figure 3. No significant increases were detected in the slope post-intervention (i.e. after the initiation of the SPQS contract in June 2014) in emergency admissions for patients with a primary diagnosis of four ACSCs in SPQS practices. Full results of significance tests are provided in Supplementary File 4. The removal of QOF has had no significant effect on emergency

admissions for these four ACSCs at the time of intervention, or in the two years following. However, for the non-SPQS Somerset practices, a significant slope change (increase) in admissions for AMI and Diabetes was observed, and a significant slope change (decrease) for admissions for Stroke was observed. These changes in admissions are therefore unrelated to the SPQS contract (see discussion below).

<figure 3 here>

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see Supplementary File 4).

DISCUSSION

We observed a variety of responses to de-incentivisation of QOF in Somerset. Some QOF-related components remained mandatory (prevalence reporting). Some 'desirable' features of the QOF system were still used (e.g. prompts during consultation), others were adapted (e.g. patient recall) and some burdensome components dropped altogether (e.g. exception reporting).

Practices reported that these alterations had led to time and resource savings in both GP consultations and administration. These time savings were used to increase involvement in implementation projects such as Symphony Test and Learn, Village Agents, Health connections, and the South Somerset Vanguard. These were planned as part of the SPQS contract and associated ongoing healthcare reforms. These local implementation projects are actively targeting service redesign for complex patient needs, using person centred coordinated care across practice contexts. These projects have involved stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources for health care assistants (including Health and Wellbeing Advisors and Health Coaches), nurses and others, single points of access for the patient, shared electronic record systems, increased use of care planning and changes to structure and timings of GP appointments. The results of our longitudinal P3C-OCT survey confirm significant improvements in P3C, suggesting that SPQS has been successful in its stated aims as a system lever for service redesign aimed at the delivery of greater person centred and coordinated primary care.

Whilst there is emerging evidence that P3C approaches can improve outcomes (particularly for complexity/multimorbidity)[36,49], we could not establish that the changes introduced via SPQS are leading to better outcomes for patients. Patient experience is downstream of the organisational changes occurring in Somerset, and any detectable improvement in patient outcomes may be delayed. The results of the patient P3C-EQ experience established a similar experience of care in Somerset compared to the control QOF practices (who represent active, research engaged-organisations, whereas completion of the survey was mandatory for SPQS practices; see methods). Similarly,

comparison of practitioner perspective of P3C to the control group revealed similar experiences in SPQS versus the control practices. These findings are broadly reflective of results from other initiatives, where – for example – patient-centred care for multimorbid patients recently revealed mixed effects on processes of care, but was not associated with measurable improvements in quality of life or other secondary outcomes, with the authors concluding that the initiative "supported changes in organisation more than it supported changing the clinicians' attitudes on which patient-centredness depends." [50]

In reference to disbenefits, we could find no evidence of increased admissions associated with SPQS. However, ITS did establish trend changes in admissions in non-SPQS Somerset practices (e.g. those practices that retained the QOF contract). A significant increase was observed in admissions with a primary diagnosis of AMI and Diabetes, and a significant decrease observed for those with a primary diagnosis of Stroke. It is, however, unlikely that relatively minor changes to QOF in the years 2014/15 and 2015/16 [51,52] have led to these observed trend changes in emergency admission.

Whilst the time series did not establish any disbenefits in SPQS practices, earlier evaluation of SPQS established that deincentivisation of QOF leads to inconsistent recording of QOF data. Subsequently, analysis of QOF scores have little utility in assessing the quality of care in Somerset[31]. This paucity of data represents a major disbenefit of QOF deincentivisation: one of the primary benefits of QOF has been the widespread recording of clinical activities[1] and availability of GP data and research[6,7]. It is not currently clear how 'quality' could be assessed in the post-QOF landscape – a question that has major implications for research, evaluation, healthcare management.

Limitation of the study

The ability to draw firm conclusions from this study were limited by several factors. Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region. These represented a biased cohort of research-engaged practices. We could not detect improvements in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, the controls were unsuitable, or changes to patient/practitioner experiences were somewhat distal to the intervention. A further limitation of the study methods was that P3C-OCT was only administered to control practices at the second time-point, meaning that we cannot determine if significant improvements of P3C-OCT score in SPQS practices might also have been present in controls.

Implications for the future

Whilst previous calls for the removal of QOF in England [53] have not been reiterated, recent policy has moved towards a reformed, streamlined version of QOF [54,55]. With QOF continuing to evolve, lessons from SPQS have implications for UK policy. We have previously made a number of suggestions for the future landscape of QOF[47,48]. These include retaining limited components of QOF (e.g. those elements that are desirable by GPs; "QOF-Lite"), the development of novel systematic data-capture (including GP contact data) or collaboration on an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs[47,48]. General Practice, however, is under huge time and resource pressures[56]. Any proposed alternatives will have to fulfil the primary requirements of being a streamlined process for supporting coordination of care, especially for those

with complex health needs. The recent national review of QOF concluded that QOF should be reformed to become more person-centred, create space for professionalism and optimally impact wider population health and system resource utilisation[57].

FIGURE LEGENDS

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see Supplementary File 4).

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DATA SHARING STATEMENT

All data relevant to the study are included in the article or uploaded as supplementary information.

COMPETING INTERESTS

None declared.

ETHICS AND FUNDING

Ethical clearance was obtained from the Plymouth University Ethics Committees (FREC). All participants were given an information pack about the study, and gave informed consent.

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CONTRIBUTIONS

J Close corresponded with partaking practices, collected data, analysed data and compiled manuscript.

B Fosh input, validated and analysed data.

H Wheat corresponded with partaking practices and collected data.

J Horrell corresponded with partaking practices and collected data.

W Lee supported the Interrupted Time Series analysis.

R Byng aided study design and conception.

Bainbridge M corresponded with partaking practices and data collection.

L Witts helped with study design, data collection and corresponded with partaking practices.

R Blackwell collected and analysed data for Hospital Episode Statistics.

L Hall corresponded with partaking practices and collected data.

Lloyd H designed and oversaw the study from inception to completion.

All authors read, contributed to and approved the manuscript.

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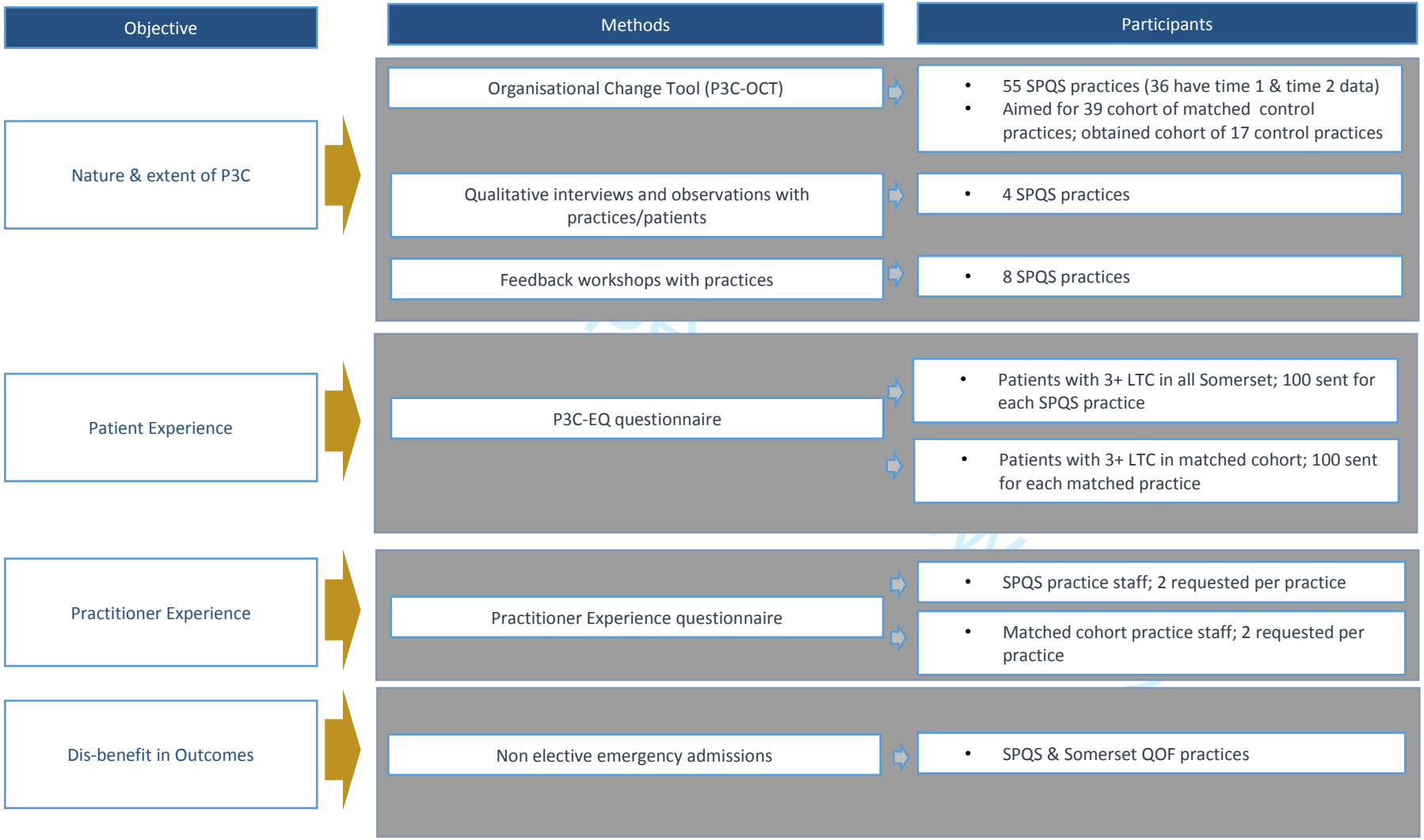
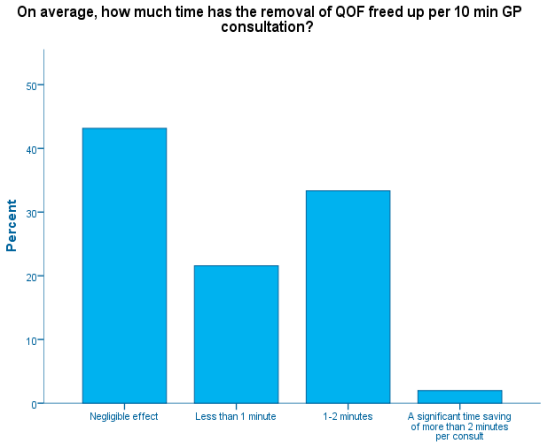
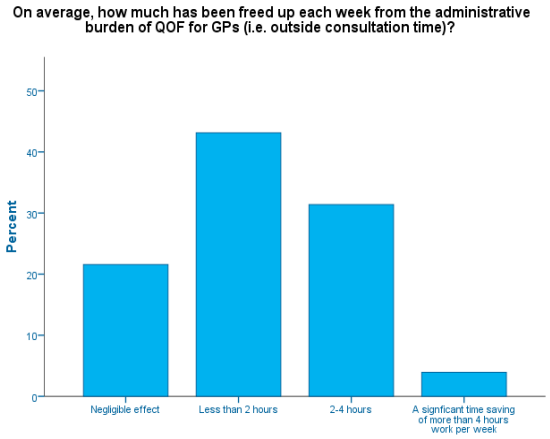
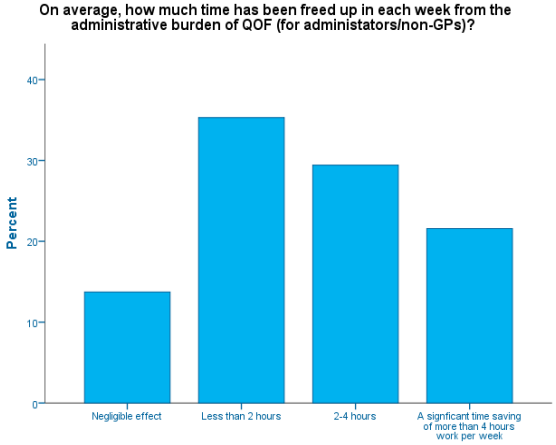
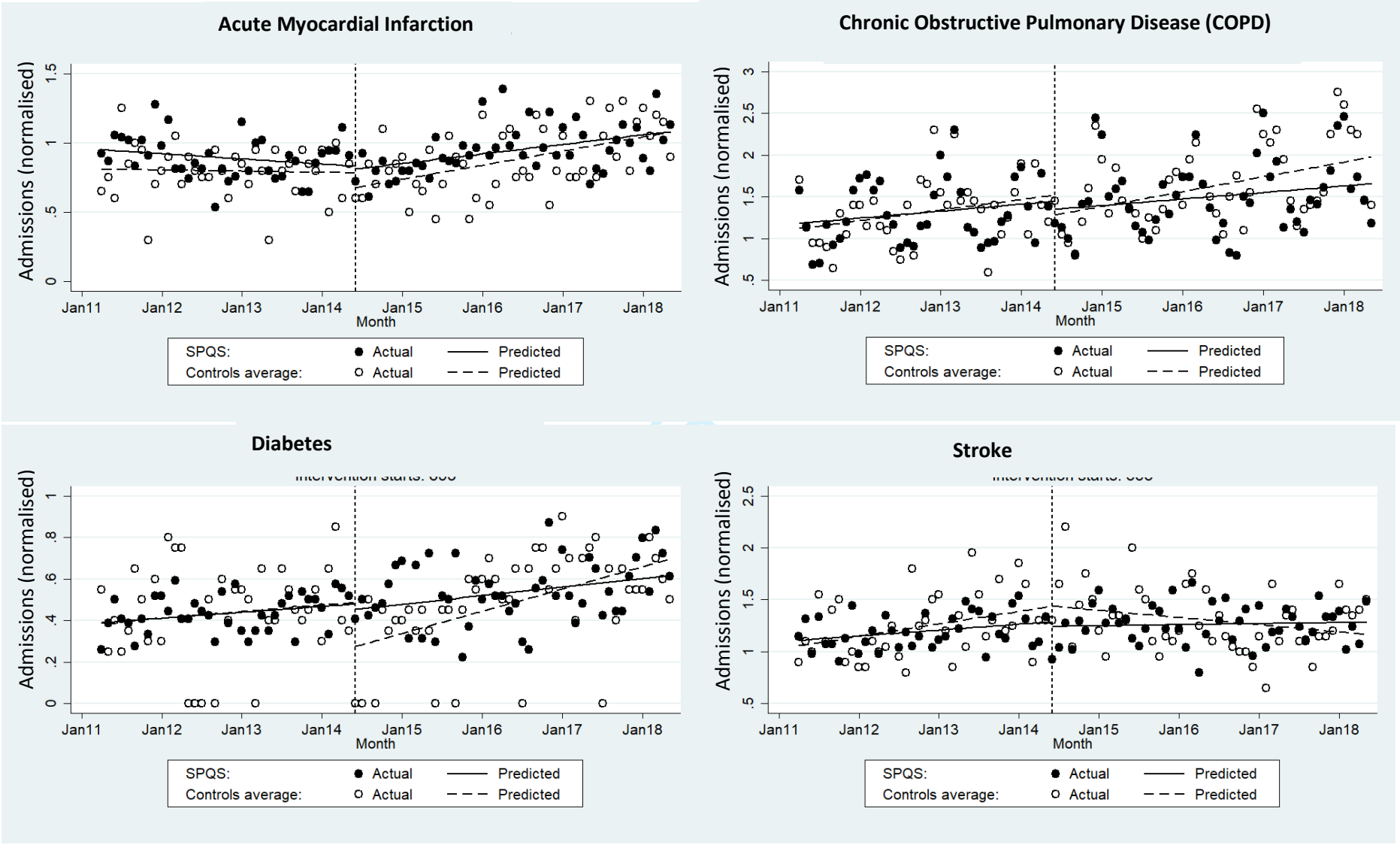

Objective
Methods
Participants
Nature & extent of P3C
Organisational Change Tool (P3C-OCT)
55 SPQS practices (36 have time 1 & time 2 data)
Aimed for 39 cohort of matched control practices; obtained cohort of 17 control practices
Qualitative interviews and observations with practices/patients
4 SPQS practices
Feedback workshops with practices
8 SPQS practices
Patient Experience
P3C-EQ questionnaire
Patients with 3+ LTC in all Somerset; 100 sent for each SPQS practice
Patients with 3+ LTC in matched cohort; 100 sent for each matched practice
Practitioner Experience
Practitioner Experience questionnaire
SPQS practice staff; 2 requested per practice
Matched cohort practice staff; 2 requested per practice
Dis-benefit in Outcomes
Non elective emergency admissions
SPQS & Somerset QOF practices








Acute Myocardial Infarction
Admissions (normalised)
0
.5
1
1.5
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Chronic Obstructive Pulmonary Disease (COPD)
Admissions (normalised)
.5
1
1.5
2
2.5
3
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Diabetes
Admissions (normalised)
0
.2
.4
.6
.8
1
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Stroke
Admissions (normalised)
.5
1
1.5
2
2.5
Jan11
Jan12
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Jan14
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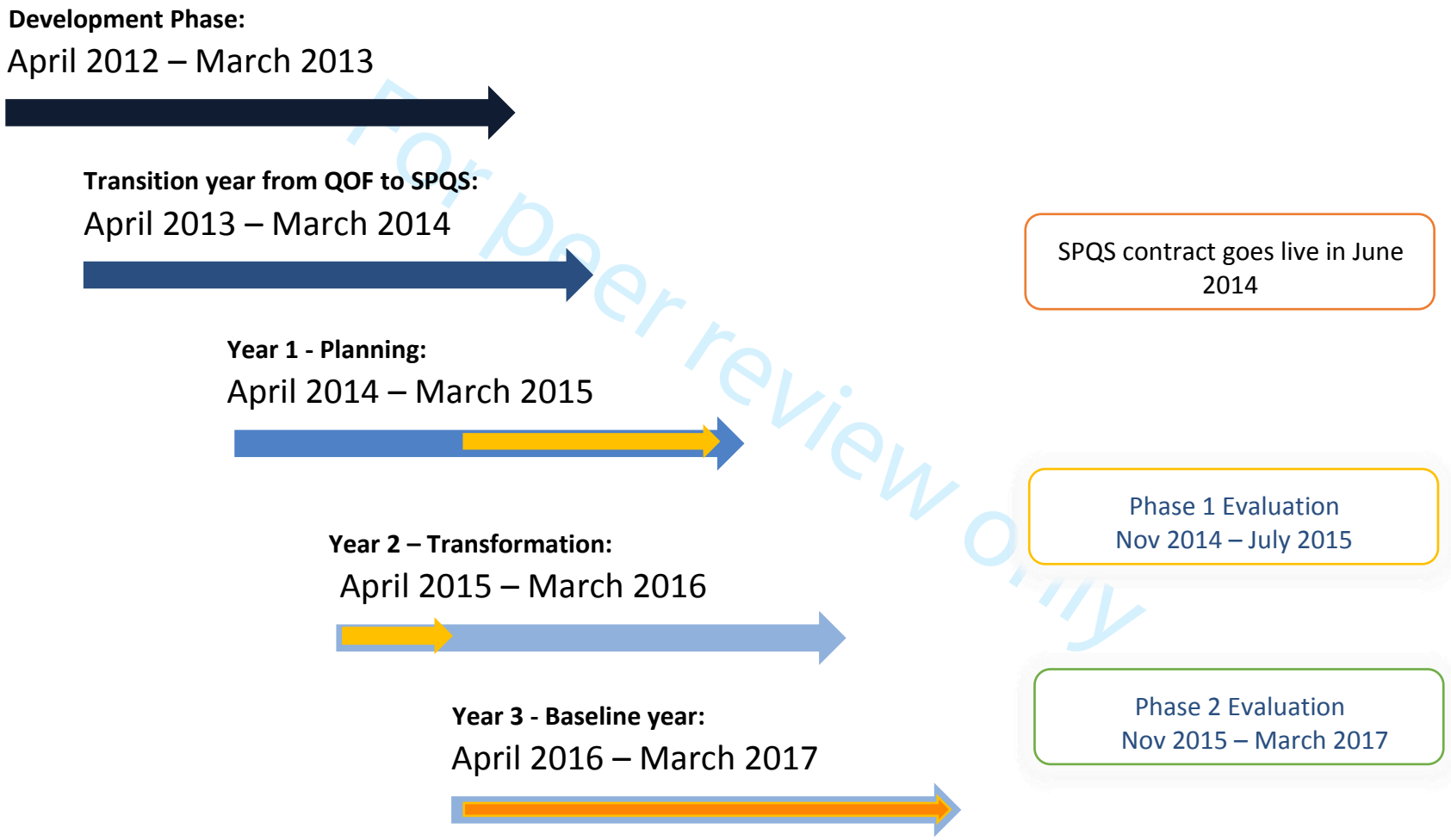
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted

Supplementary File 1: Overview of Sustainability and Transformation Plan (STPs) for 28 of 55 practices (anonymised) enrolled in SPQS; with 2 further STPS completed at federation level.

Activities:	TOTAL for each activity (from a total of 30 STPs):	Practice 1	Practice 2	Practice 3	Practice 4	Practice 5	Practice 6	Practice 7	Practice 8	Practice 9	Practice 10	Practice 11	Practice 12	Practice 13	Practice 14
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	20 (66.6%)	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Continued/increased involvement in Mendip Your Health & Wellbeing	5 (16.7%)	✓					✓		✓	✓		✓			
Use/development of technology to assist self-management	3 (10%)		✓		✓										
Increased use of Health Connectors Mendip	4 (13.3%)		✓				✓			✓	✓				
Investing time in community engagement	2 (6.7%)		✓												
MDTs in care coordination hubs	1 (3.3%)		✓												
MDTs with district nurses at palliative care reviews (weekly)	1 (3.3%)		✓												
Engagement in compassionate communities and network mapping	1 (3.3%)		✓												
Increased or continued participation with Symphony	12 (40%)				✓		✓	✓	✓	✓		✓			
Possible division of urgent and routine care & formation of urgent care hub	6 (20%)				✓		✓		✓				✓	✓	
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)	17 (56.6%)		✓	✓	✓				✓	✓		✓		✓	
Consideration of practice merger	7 (23.3%)				✓		✓	✓	✓	✓					
Training & upskilling	5 (16.7%)									✓					
Engagement in Somerset together programme	1 (3.3%)											✓			
Development of personalised care planning	1 (3.3%)											✓			
Telephone consultations/ telemedicine	2 (6.7%)														
Use of health coaches	9 (30%)														
Engagement in Living Better programme	1 (3.3%)														

	Practice 15	Practice 16	Practice 17	Practice 18	Practice 19	Practice 20	Practice 21	Practice 22	Practice 23	Practice 24	Practice 25	Practice 26	Practice 27	Practice 28	Federation 1	Federation 2
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	✓	✓	✓									✓	✓	✓	✓	✓
Continued/ increased involvement in Mendip Your Health & Wellbeing																
Use/development of technology to assist self-management															✓	
Increased use of Health Connectors Mendip																
Investing time in community engagement												✓				
MDTs in care coordination hubs																
MDTs with district nurses at palliative care reviews (weekly)																
Engagement in compassionate communities and network mapping																
Increased or continued participation with Symphony					✓	✓	✓				✓		✓	✓		
Possible division of urgent and routine care & formation of urgent care hub																✓
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)	✓	✓	✓	✓		✓		✓	✓	✓			✓			✓
Consideration of practice merger											✓					✓
Training & upskilling	✓	✓	✓	✓												
Engagement in Somerset together programme																
Development of personalised care planning																
Telephone consultations/ telemedicine	✓	✓														
Use of health coaches	✓	✓				✓		✓	✓	✓		✓	✓	✓		
Engagement in Living Better programme																✓

Supplementary File 2: Timeline of SPQS scheme and evaluation.



1

Full results of P3C-Practitioner questionnaire

Selection of P3C-Practitioner

The P3C-practitioner was selected for this study by initially conducting a scoping review to identify measures that included aspects of professional experiences of integrated/coordinated care. This identified 33 measures, four of which were deemed relevant (Safety Net Medical Home Provider Experience Survey; Person-Centred Health Care for Older Adults Survey" (PCHCOA) – which we refer to as the "P3C-practitioner"; Staff Questionnaire - Integrated Care Evaluation Pilots; North West London Integrated Care Pilot - Practitioner Survey). These measures were then presented to workshop attendees (healthcare professionals; managers; senior NHS England representatives; local commissioners; academics) to explore the strengths and weaknesses in terms of applicability and utility as part of routine data collection in respective settings. The PCHCOA was selected due to its established psychometric properties (Briony Dow et al., *Development and initial testing of the Person-Centred Health Care for Older Adults Survey*, 25 *International Psychogeriatrics* 1065–1076 (2013)), its good coverage of domains of P3C and a positive response at the feedback workshop. For the purposes of this evaluation, we have renamed the instrument the P3C-practitioner.

Scoring of P3C-Practitioner

Whilst previously validated, the authors did not develop an aggregate scoring mechanism for the instrument. Therefore, we generated summary scores by simple addition from the 4-point Likert scale (Never = 0; Rarely = 1; Sometimes = 2; Usually = 3; Always = 4). This allowed us to compare aggregate scores to compare SPQS versus controls over all 29 questions (see table below), with significance tested using MWW test. We also generated sub-scales by addition of question relevant to this aspect of P3C (see following page for questions). No significant differences were detected in practitioner experiences in SPQS or control practices, for either mean scores or the following subscales.

Sub-Scale: Person Centred Care = Questions 1.1, 1.3, 1.4, 2.1, 2.2, 5.1, 6.1,6.2,6.3, 7.1, 7.2, 7.3, 8.1 8.2 and 8.3.

Sub-Scale: Coordinated Care = Questions 4.1, 4.2, 4.3

Sub-Scale: Working Environment = Questions 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7

	QOF	SPQS	Sig. (2-tailed)
Mean Score	**83.79 (n=29)**	**86.18 (n=98)**	**.4**
Sub-Scale: Person Centred Care	47.62	49.11	.35
Sub-Scale: Coordinated Care	7.41	8.38	.12
Sub-Scale: Working Environment	22.03	21.11	.24

P3C-Practioner instrument

Q1.1 In my work area, service users / patients have an equal say with the rest of the team in the development of the support plan.

Q1.2. In my work area, service users / patients and carers have an equal say with the rest of the team in the development of the discharge plan or exit strategy from the service.

Q1.3. My/our support plans are structured around the service user's/patient's goals.

Q1.4. Where I currently work, we provide services in the location that best suits the needs and preferences of the service user/patient and their carers.

Q2.1. I ask service users/patients what their goals/needs are for their health and wellbeing.

Q2.2 I ask the carer/s what their goals/ needs are for the health and wellbeing of the person they support.

Q3.1. I am supported to develop the skills I need to work with the service user/patient and their carers.

Q3.2. Where I am currently working, I have been exposed to good role models in care/support for service users/patients.

Q3.3. Expectations of my role and how I treat the service users/patients I support are communicated clearly and consistently.

Q3.4. I feel that I work as part of a team with a recognised and valued contribution.

Q3.5. The emotional and physical demands of my work are acknowledged and recognised.

Q3.6. I feel that I am able to fully use my skills in my work with the service users/patients

Q3.7. My work environment values the care/support I provide to the service users/patients.

Q4.1. It is clear to the service user/patient or their carer who their key worker is.

Q4.2. The service user/patient and their carer have ready access to a key identified person (i.e. they are available by phone, messages are returned promptly).

Q4.3. Where I currently work, we know how to direct the service user/patient to the most appropriate service without them having to make another call (single point of contact).

Q4.4. After the service user/patient is discharged/leaves the service, they receive a follow-up phone call or visit.

Q5.1. Where I currently work, adequate transport and parking are provided to ensure access for service users/patients and their families/carers.

Q5.2. Where I currently work, service users'/patients' personal privacy is respected.

Q6.1. I am able to meet the communication needs of service users/patients and their carers when working with them.

Q6.2. Written materials are provided by my place of work to service users/patients and their carers in a language they can understand.

Q6.3. Information is provided in a variety of ways to ensure all service users/patients and their carers have access (e.g. written, verbal, visual).

Q7.1. I welcome it when service users/patients are informed and question or challenge my advice.

Q7.2. The needs and preferences of service users/patients should be central in all services.

Q7.3. I like working with the service users/patients I support or care for.

Q8.1. It is an important part of my job to get to know my service user/patient (e.g. call them by their preferred name, remember and repeat something they have told me).

Q8.2. I give service users and their carers adequate time to talk to me (e.g. to discuss their concerns and their expectations).

Q8.3. I seek to find out what is important to service users/patients about their health and wellbeing (e.g. mobility, cognitive function, being part of the family, able to go to the gym).

Supplementary File 4: Results of interrupted time-series analysis for emergency admissions on four long-term, ambulatory care sensitive conditions (ACSCs). Full results are provided, although the most relevant statistical tests (column "P>|t|") are for the rows:

"_z_x659" the difference between the changes in intercept for SPQS and QOF pre/post intervention)

"_z_x_t659" the difference between the changes in gradient for SPQS and QOF pre/post intervention.

All are non-significant, revealing no excess increases in emergency admissions in SPQS practices for these four ACSCs after the implementation of the SPQS scheme. Significant differences were observed, however, for changes in the *control* slope and/or intercept pre/post intervention for Acute Myocardial Infarction, Stroke and Diabetes . These are highlighted in red below.

Acute Myocardial Infarction (AMI)

		Newey-West				
Description	**PRIM_AMI**	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**
Pre-intervention control gradient	_t	-.0007003	.0025541	-0.27	0.784	-.0057435 .0043429
Difference between control/SPQS pre-intervention intercepts	_z	.1396686	.0801094	1.74	0.083	-.0185102 .2978475
Difference between control/SPQS pre-intervention slopes	_z_t	-.0024182	.0034503	-0.70	0.484	-.009231 .0043946
Change in control intercept	_x653	-.1043759	.0677199	-1.54	0.125	-.2380911 .0293393
Change in control slope	**_x_t653**	**.0091594**	**.0030779**	**2.98**	**0.003**	**.0030819 .0152369**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.0853708	.0946241	0.90	0.368	-.1014677 .2722093
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0003106	.0040914	-0.08	0.940	-.0083892 .0077679
Intercept of control pre-intervention	_cons	.8103239	.0652408	12.42	0.000	.6815037 .9391441

Chronic Obstructive Pulmonary Disease (COPD)

Description	PRIM_COPD	Newey-West Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0105427	.0048903	2.16	0.033	.0008867	.0201988
Difference between control/SPQS pre-intervention intercepts	_z	.0619958	.1748488	0.35	0.723	-.2832492	.4072408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0035803	.0077243	-0.46	0.644	-.0188323	.0116717
Change in control intercept	_x653	-.2382072	.1889151	-1.26	0.209	-.6112265	.1348121
Change in control slope	_x_t653	.0041691	.0078257	0.53	0.595	-.011283	.0196211
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.1413474	.2797523	0.51	0.614	-.4110331	.693728
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0046434	.011329	-0.41	0.682	-.0270129	.0177261
Intercept of control pre-intervention	_cons	1.122065	.1089517	10.30	0.000	.9069359	1.337194

Stroke

Description	PRIM_STRK	Newey-West Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0100503	.0041188	2.44	0.016	.0019176	.0181831
Difference between control/SPQS pre-intervention intercepts	_z	.0528715	.0954745	0.55	0.580	-.1356461	.2413891
Difference between control/SPQS pre-intervention slopes	_z_t	-.0053472	.0047727	-1.12	0.264	-.014771	.0040765
Change in control intercept	_x653	-.0003719	.1374057	-0.00	0.998	-.2716843	.2709404
Change in control slope	**_x_t653**	**-.0158336**	**.005394**	**-2.94**	**0.004**	**-.0264841**	**-.005183**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	-.0449425	.1616696	-0.28	0.781	-.3641647	.2742798
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0119868	.0062141	1.93	0.055	-.0002831	.0242568
Intercept of control pre-intervention	_cons	1.05749	.0852406	12.41	0.000	.8891793	1.2258

Diabetes

Description	PRIM DIAB	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0025823	.0026916	0.96	0.339	-.0027323	.0078969
Difference between control/SPQS pre-intervention intercepts	_z	.0005698	.0759019	0.01	0.994	-.1493012	.1504408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0001994	.0029745	-0.07	0.947	-.0060726	.0056738
Change in control intercept	**_x653**	**-.2114749**	**.0751425**	**-2.81**	**0.005**	**-.3598463**	**-.0631036**
Change in control slope	_x_t653	.0063408	.0033715	1.88	0.062	-.0003164	.012998
difference between the changes in intercept for SPQS and QOF pre/post intervention	**_z_x653**	**.1864524**	**.0866148**	**2.15**	**0.033**	**.0154285**	**.3574763**
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0052892	.0038335	-1.38	0.170	-.0128586	.0022802
Intercept of control pre-intervention	_cons	.3890688	.0704267	5.52	0.000	.2500088	.5281288

Combined (AMI/COPD/Stroke/Diabetes

Description	SECD_AMI	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0224751	.0064245	3.50	0.001	.0097898	.0351604
Difference between control/SPQS pre-intervention intercepts	_z	.2551058	.227217	1.12	0.263	-.193542	.7037535
Difference between control/SPQS pre-intervention slopes	_z_t	-.0115452	.009923	-1.16	0.246	-.0311385	.0080482
Change in control intercept	**_x653**	**-.5544301**	**.2489365**	**-2.23**	**0.027**	**-1.045964**	**-.0628964**
Change in control slope	_x_t653	.0038357	.0103935	0.37	0.713	-.0166866	.024358
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.3682284	.3741294	0.98	0.326	-.3705031	1.10696
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0017436	.0148231	0.12	0.907	-.0275252	.0310124
Intercept of control pre-intervention	_cons	3.378947	.1531439	22.06	0.000	3.07656	3.681335

STROBE Statement—checklist of items that should be included in reports of observational studies

	PAGE/LINE NUMBER IN MANUSCRIPT	Recommendation
Title and abstract	p2	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	P3-5	Explain the scientific background and rationale for the investigation being reported
Objectives	L126-132	State specific objectives, including any prespecified hypotheses
Methods		
Study design	L135-145	Present key elements of study design early in the paper
Setting	Setting L135-145; dates L210-217	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	L148-168	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	L169-198	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	L169-198	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	L158-161	Describe any efforts to address potential sources of bias
Study size	L149-151	Explain how the study size was arrived at

Quantitative variables	L209-235	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	L209-235	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	L239-247	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	Table 1	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	L239-282	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	L239-357	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	N/A	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	L360-397	Summarise key results with reference to study objectives
Limitations	L405-413	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	N/A	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	N/A	Discuss the generalisability (external validity) of the study results
Other information		
Funding	L451-6	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

A Longitudinal Evaluation of a Countywide Alternative to the Quality and Outcomes Framework in UK General Practice, Aimed at Improving Person Centred Coordinated Care.

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A Longitudinal Evaluation of a Countywide Alternative to the Quality and Outcomes Framework in UK General Practice, Aimed at Improving Person Centred Coordinated Care.

Close, James james.close@plymouth.ac.uk

Corresponding author.

University of Plymouth, Community and Primary Care research group
ITTC Building
Davy Road, Plymouth Science Park
Derriford, Plymouth
Plymouth, UK PL6 8BX
01752 764260

Fosh, Ben Ben.fosh@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW
07860593505

Wheat, Hannah H.Wheat@exeter.ac.uk

University of Exeter, Sociology, Philosophy and Anthropology department
Exeter, UK

Horrell, Jane jane.horrell@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW
01752 764260

Lee, William william.lee@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW

Byng, Richard richard.byng@plymouth.ac.uk

University of Plymouth, Community and Primary Care Research Group
1 Davy road
Plymouth Science park
Plymouth
Plymouth, UK PL4 0EW

Bainbridge, Michael Michael.Bainbridge@somersetccg.nhs.uk

NHS Somerset Clinical Commissioning Group
Yeovil, Somerset, UK

Blackwell, Richard Richard.Blackwell@swahsn.com

South West Academic Health Science Network
Exeter, UK

Witts, Louise Louise.Witts@swahsn.com

South West Academic Health Science Network
Exeter, UK

Hall, Louise Louise.Hall@swahsn.com

South West Academic Health Science Network
Exeter, UK

Lloyd, Helen helen.lloyd-1@plymouth.ac.uk

Keywords: Organisational development; Organisation of health services; Quality in health care; PRIMARY CARE

Evaluation of a Countywide Alternative to the Quality and Outcomes Framework, Aimed at Improving Person Centred Coordinated Care.

Abstract

Objectives.

To evaluate a county-wide deincentivisation of the Quality and Outcomes Framework (QOF) payment scheme for UK General Practice (GP).

Setting

In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups. Fifty-five GP practices in Somerset established the Somerset Practice Quality Scheme (SPQS) – a de-incentivisation of QOF – with the goal of redirecting resources towards Person Centred Coordinated Care (P3C), especially for those with Long Term Conditions (LTCs). We evaluated the impact on processes and outcomes of care from April 2016 to March 2017.

Participants & Design

The evaluation used data from 55 SPQS practices and 17 regional control practices for three survey instruments. We collected patient experiences ('P3C-EQ'; 2363 returns from patients with 1+ LTC; 36% response rate), staff experiences ('P3C-practitioner'; 127 professionals), and organisational data ('P3C-OCT'; 36 of 55 practices at two time points, 65% response rate; 17 control practices). Hospital Episode Statistics emergency admission data were analysed for 2014-2017 for ambulatory-sensitive conditions across Somerset using interrupted time series.

Results

Patient and practitioner experiences were similar in SPQS versus control practices. However, discretion from QOF incentives resulted in time savings in the majority of practices and SPQS practice data showed a significant increase in P3C oriented organisational processes, with a moderate effect size (Wilcoxon signed rank test; p=0.01; r=0.42). Analysis of transformation plans and organisational data suggested stronger federation-level agreements and informal networks, increased multidisciplinary working, reallocation of resources for other health care professionals and changes to the structure and timings of GP appointments. No disbenefits were detected in admissions data.

Conclusions

The SPQS scheme leveraged time savings and reduced administrative burden via discretionary removal of QOF incentives, enabling practices to engage actively in a number of schemes aimed at improving care for people with LTCs. We found no differences in the experiences of patients or healthcare professionals between SPQS and control practices.

Article Summary

Strengths and limitations of this study

- This study evaluated changes to service delivery, conducted using two survey tools – offering a perspective on the experiences of both patients and healthcare professionals.
- These were supplemented with a longitudinal analysis of organisational change (to measure alterations to service deliver) and a time-series of emergency admissions for ambulatory-sensitive conditions (to detect disbenefits arising from the scheme).
- Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region.
- No detectable improvements were established in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, or changes to patient/practitioner experiences were somewhat distal to the intervention.

Main Text

BACKGROUND

The Quality and Outcomes Framework (QOF) for UK General Practice (GP) is one of the largest health-related pay-for-performance (P4P) schemes in the world[1]. Following implementation in 2004, the scheme initially had a positive impact on quality of care, primarily achieved via establishment of consistent procedural baselines in the clinical management of incentivised (mostly chronic) diseases[1–5]. It reduced between-practice inequalities in care delivery[1–3] whilst also leading to improved disease registers, widespread recording of clinical activities and adoption of electronic medical record systems[1], leading to growth in GP data and related research[6,7].

Since the introduction of QOF, demographic shifts of an ageing population have continued to drive a shifting clinical landscape[8], with the number of people with three or more long-term conditions (mLTCs) thought to have risen by one million over the last decade[9]. The subsequent rising demand for the management of long term conditions (LTCs) and mLTCs – requiring tailored and coordinated support[10,11] – has led to QOF (with its emphasis on processes for single disease guidelines) being viewed as increasingly anachronistic[6,12–16]. After introduction of QOF, there was a significant reduction in the continuity of care[2,17] and the person-centeredness of GP consultations[13,14,18,19], with a subsequent decline in patients' satisfaction[20]. It has been argued that QOF does not incentivise appropriate clinical care for people with multimorbidity[6,12–16], who require individualised support, greater continuity of care and a holistic, biopsychosocial approach that is responsive and empowering[10,11]. An oft-quoted criticism is that QOF reduces consultations to a 'box-ticking' exercise[21].

In response to such criticisms, both the NHS Chief Executive and the General Practitioners Committee (GPC) Chairman previously backed the removal of QOF[21] and In 2014, NHS England signalled a move towards devolution of QOF to Clinical Commissioning Groups (CCGs), allowing organisations the freedom to develop alternatives. Potential advantages included the targeting of local health needs

and greater clinical engagement for quality improvement[22]. In response, the Somerset Practice Quality Scheme (SPQS) was established as a de-incentivisation of QOF. It arose because GPs, the CCG and the Local Medical Committee (LMC) felt that QOF was not incentivising the highest value clinical behaviour. The goal was to allow clinicians the freedom to innovate, enable consultations to be more person-centred and increase involvement with a number of concurrent schemes aimed at improving Person Centred Coordinated Care (P3C)[23]. The details of the scheme were included in the SPQS contract[24] and local Sustainability and Transformation Plan (STPs – Plans for reforming healthcare mandated by the Five Year Forward View[25]) of the GPs[26]. (See Supplementary File 1 for a summary of Somerset STPSs; box 1 for brief details of the various schemes and references for details). The contract removed incentives from QOF, although CQRS (Calculating Quality Reporting System) remained active in order to collect prevalence data for payment calculations. The SPQS contract stated that the reduced QOF overhead would be exploited to better meet the needs of patients with long term conditions by developing new models of care. Implementation was specified in the locality STPs, which included a patchwork of initiatives, most notably the 'Test and Learn pilots', which encompassed three distinct schemes (box 1), all of which had a shared vision of targeting complex patients with care plans, multidisciplinary team input (MDT) and single point of contact [27,28] . Other schemes included a Village Agents service[29] and Health Connections Mendip (HCM)[30] – see box 1. Fifty five Somerset practices opted for SPQS, with 18 Somerset practices (initially 20) retaining the existing QOF contract. (The SPQS practices increased to 57 in 2015/16; but two mergers reduced it back to 55).

Test & Learn: Comprises three similar initiatives (South Somerset Symphony Vanguard, Taunton, and Mendip – see below), which share a common goal of targeting complex, multimorbid patients with a suite of approaches including single personalised care plans, multi-disciplinary team input and single point of access to provide person centred coordinated care.

> **Test & Learn – South Somerset Symphony Vanguard**: A symphony "hub" system located at Yeovil District Hospital, where complex patients receive extra support from Health Coaches/Key Workers at the Symphony hub service, although they remain under management of GP practice [27,28].
>
> **Test & Learn – Taunton:** Operates under a "virtual hub" model, with complex/frail patients managed by a multidisciplinary team moving between practices, with shared care plans and Wellbeing Advisors.
>
> **Test & Learn – Frome Mendip, including "Health Connections Mendip".** With loose eligibility criteria and a number of referral routes, Community Practice Nurse and Health Connectors (based at Frome) liaise regularly in MDT meetings. There is a hub telephone line for single point of access. The model advocates utilising existing assets in the community. The Health Connections team lead social prescribing work with a service directory to signpost patients to appropriate resources [30].

Enhanced Primary Care (EPC): EPC is a sub-component of the Symphony vanguard scheme that incorporates health coaches (HCs) into primary care, focusing on less complex patients, allowing GPs to focus primarily on medical problems.

Village Agents Service: Supports isolated, excluded and vulnerable (including elderly and multimorbid) people by offering a signposting and referral service. The service links with general practices [29].

Living Better: A working partnership between the GP practices, AGE UK Somerset, Social Care, Somerset Partnership, West Somerset District Council, and Somerset Clinical Commissioning Group. The project supports people with one or more long-term conditions to better self-manage, helping them build connections to the community and reducing dependency on health and social care.

Box 1. Initiative for implementation of SPQS.

The initial phase of the scheme was previously evaluated with a retrospective approach[31]. This revealed early stages of organisational change, including stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources towards health care assistants, nurses and others, and changes to structure and timings of appointments with GPs. From April 2016 to March 2017 we conducted a longitudinal evaluation of the second full year of the SPQS programme (see Supplementary File 2 for a timeline of the SPQS scheme and associated evaluations). This was commissioned with the aims of establishing the nature and extent of P3C that

has been implemented since discretion from QOF, explore staff and patient experiences of care delivery and examine non-elective hospital admissions before and after inception of the scheme.

METHODS

We conducted a mixed-methods evaluation of SPQS which included a suite of quantitative and qualitative tools. Analysis of quantitative data is described in this paper. In-depth qualitative findings will be published in a subsequent paper (including semi-structured interviews with practitioners; observations of consultations and facilitation workshops with practices). A schematic overview of the full SPQS evaluation framework is provided in figure 1. The quantitative evaluation included completion of survey tools targeting patient experiences (P3C-EQ), staff experiences (P3C-practitioner) and organisational perspectives (P3C-OCT tool), alongside time series of Hospital Episode Statistics (HES) for ambulatory-sensitive conditions across Somerset. We chose not to use national measures of General Practice (i.e. GP Patient Survey (GPPS) and Friends and Family Test (FFT)): they have a broad sample and do not target the patient group (i.e. patients with LTCs) that are the focus of SPQS. Furthermore, they do not target the construct of interest (i.e. P3C).

<figure 1 here>

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Samples

The 55 participating Somerset practices (mean list size = 7,695; median = 6515.5; smallest = 1834; largest = 29,078) completed our evaluation tools (see below). Whilst these 55 practices were incentivised to take part in our evaluation (i.e. by being part of SPQS), the non-SPQS Somerset practices had no incentive to act as controls and did not participate in this study. Therefore, for control practices, we initially identified a cohort of non-Somerset control practices matched for staffing data, list size, population density, indices of multiple deprivation, QOF scores and disease prevalence. However, the incentives available for this evaluation (£200 per practice) were only sufficient to recruit six practices by this method. We therefore supplemented this group with 11 unmatched practices from across the Southwest, making a total of 17 control practices (mean list size = 6,714; median = 4878; smallest =2678; largest = 4878). The control group therefore represents a self-selected sample of practices that are likely to represent engaged, active practices (i.e. with the resources to engage with research). In contrast, completion of our evaluation was mandatory for all SPQS practices.

Patient and Public Involvement

Patients were involved via the peninsula CLAHRC patient involvement group (PenPig), who set priorities for research objectives. Patients, public and healthcare professionals were also involved in co-design workshops to develop the measurement framework and individual questionnaires (see papers for details [23,32–37]). Patients also reviewed drafts of ethics approval applications and all patient-facing communication. The work was co-presented with patients at the South West Society for Academic Primary Care Regional Meeting 2018.

Survey Tools

The P3C-Patient Experience Questionnaire (P3C-EQ) is a brief, 11-item patient-completed measure of patient experiences of person centred coordinated care delivery, which we have previously

validated[32,38,39]. The tool can be used to generate an aggregate score of patient experience[32], with a range of score from 0-30, where a higher score indicates better experiences of care [39]. It can also be sub-scored to previously described sub-domains of P3C[23,32,34–37].

The P3C-Practitioner Experience Survey is a 29-item instrument that measures individual and managerial experience of delivering person centred and coordinated care. Via a workshop with healthcare professionals, we selected the previously validated P3C-Practitioner questionnaire (also known as the Person-Centred Health Care for Older Adults Survey[40]) as the most suitable instrument to examine practitioners' perspectives of P3C (see Supplementary File 3). A minimum of two practitioners from each practice were requested to respond. The instrument generates an aggregate score with a range of 29-145, where a higher score indicates better experiences of care.

The P3C-Organisational Change Tool (P3C-OCT) is an evidenced-based measure of progress towards delivering person centred coordinated care from an organisational perspective[33]. It was developed to support and measure P3C in line with Year of Care[34] and RCGP principles of Collaborative Care and Support Planning[41], thus providing a way to monitor changes in line with policy directives which improve P3C. The tool was designed to measure all core P3C routines which have been identified through research[42,43], patients' accounts, policy documents[34] and our own work[23,33]. The design of the P3C-OCT is based on a shared consensus of the components of person-centred coordinated care (e.g. [35,36,44]), which broadly correspond to six domains: Information and Communication; Care Planning; Goals and Outcomes; Transitions; Organisational Process Activities; and Decision Making. These domains have been mapped to real-world actions that support the delivery of P3C (e.g. multi-disciplinary team meetings, care planning, provisions for information etc.) This allows the tool to translate concepts which are often abstract, and may be drawn from academic literature and policy documents, into actionable, tangible processes which a practice can implement. The result is a unique 29-question instrument with over 500 different possible responses, which provides a detailed and practical interrogation of P3C delivery. An equally-weighted scoring system allows results of the P3C-OCT to be aggregated into a single composite score, or alternatively by sub-domains of P3C – generating a score of 0-20, with higher scores indicating more P3C related activity.

The P3C-OCT provides a detailed profile of care delivery and organisation through 29 core questions. All questions ask about objective activities (e.g. processes in place to deliver P3C) and subjective responses (e.g. how well these are working). Scores are given out of a theoretical maximum of 20 points. The P3C-OCT was also prepended by a series of SPQS-related questions about administrative and consultation time savings from discretion from QOF. Each SPQS practice was requested to complete the P3C-OCT at two time points (from Feb-Aug 2016 and Dec 2016-Mar 2017). In contrast, control practices only completed the P3C-OCT once (at Time 2).

Data Collection

All participating practices supported data collection of the three survey tools. With the P3C-EQ, from each practice, 100 patients with one or more LTCs, randomly sampled from the practice list (using a customised EMIS script), were invited to complete a postal questionnaire at a single time point. Patients received an information pack, consent sheet, demographic questionnaire and P3C-EQ. All returned questionnaires were entered into a Microsoft Access database prior to statistical analyses. For the P3C-Practitioner, we obtained an opportunity sample via both written and email communication with all participating practices. For the P3C-OCT, all participating practices were

offered an electronic or paper version, and we requested that the tool was completed by a combination of General Practitioner and Practice Manager (PM), thus ensuring representation of front-facing and backend operations of GP surgeries. Completion of the tool was mandatory as part of the SPQS evaluation.

Analysis

SPQS and control practices were compared on the P3C-Patient Experience survey and the P3C-Practioner Experience Survey (at time 2; 6-12 months after initiation of second year/phase 2 of SPQS), with significance tested using the non-parametric unmatched Mann–Whitney–Wilcoxon (MWW) test taking into account within-practice clustering by calculating Somers' D statistic (non-parametric tests were used, as the scoring is a summation of Likert responses i.e. data was ordinal). For the P3C-Organisational Change Tool, we compared Time 1 (immediately after implementation of second year/phase 2 of SPQS) and Time 2 (6-12 months later), with significance evaluated by Wilcoxon signed rank test.

Time Series of emergency admissions to hospital

A multi-group interrupted time-series analysis (ITS) was conducted to identify whether de-incentivisation of QOF and the introduction of SPQS was associated with changes in emergency admissions to acute hospitals with a primary diagnoses for four long-term, ambulatory care sensitive conditions (ACSCs). Hospital episode statistics were obtained for patients from all 55 GP practices enrolled in the SPQS scheme (actually 56 practices in 2015/15) and 18 Somerset QOF practices (i.e. Somerset practices not enrolled in SPQS; initially 20). Data was obtained for a 70 month period from April 2011 to May 2018. This time period is divided into 38 months pre-intervention (Apr 2011 – May 2014) and 48 months post intervention (June 2014 – May 2018; SPQS contract went live in June 2014, month 39). Data include monthly admission counts for four ACSCs: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes, and Stroke. We selected these ACSCs as a proxy for preventable admissions and an indicator of any deteriorating quality of care associated with SPQS. Due to the difference in number of practices between SPQS and QOF practices, admissions were divided by the number of practices, thus providing an average of emergency admissions (expressed as admissions per month per practice). Analysis was performed using the *itsa* command[45] on STATA (StataCorp Ltd). This uses regression-based model with Newey-West standard errors. Pre- and post-intervention slopes/intercepts of the sample (SPQS practices) were compared to controls (QOF practices). Lag period was set to 1 month.

RESULTS

P3C-EQ

There were 1,752 responses received from 49 (89%) of the 55 practices enrolled in SPQS, and 611 responses from patients enrolled in the 17 control (QOF) practices (36% response rate and similar to other similar other studies[46]). The responses of the two groups compared in Table 1.

Table 1: Demographic profile of responses to P3C-EQ as percentages.

Participant demographics as a percentage										
Age			**Education**			**Gender**			**Multi-morbidity**		
	QOF	SPQS		QOF	SPQS		QOF	SPQS	**No. LTCs**	QOF	SPQS
<=24	0.3	0.4	None	1.0	1.3	Male	44.0	43.4	1	19.6	20.1
25-34	2.5	1.3	Primary	3.1	2.1	Female	53.8	53.9	2	19.6	23.8
35-44	2.5	2.6	Secondary	33.7	34.6	Non-response	2.2	2.7	3	20.6	17.8
45-54	8.8	5.3	College/Vocational	26.4	28.1				4	11.3	13.7
55-64	18.3	13.3	Undergraduate	11.5	10.8				5	9.3	7.5
65-74	25.7	29.2	Postgraduate	8.2	7.8				6	4.7	5.1
75-84	29.3	32.7	Non-response	16.2	15.3				7	2.8	2.8
>=85	12.1	14.1							>=8	4.2	2.8
Non-response	0.5	1.0							Non-response	7.9	6.4

The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1,752) and QOF controls (23.68, n. 611) were not significantly different (MWW U test; *p=0.346*), and indicate generally positive experiences of care across both samples.

P3C-Practitioner results

Full results of the P3C-Practioner are provided in Supplementary File 3. We received 98 responses from 55 SPQS practices and 29 responses from 18 control practices from a mix of healthcare professionals – 62 GPs (49%); 35 Nurses (27%); 12 Wellbeing Advisors; 7 LTC nurse; 11 others. The mean global aggregated scores for the P3C-EQ for SPQS (23.39, n.1752) and QOF controls (23.68, n. 611) were not significantly different (MWW test; *p=0.405*). Return rates are not applicable, as this was a convenience sample where we requested response from at least two different professionals at each practice.

P3C-OCT Results

To evaluate changes to P3C during the SPQS scheme we undertook an analysis of the organisation and delivery of care using the P3C-OCT. Of 55 practices enrolled in the scheme, 36 practices provided admissible data (i.e. complete and timely) at the two evaluation time-points (Time 1: 2/2016–8/2016 and Time 2 was 12/2016-5/2017; 65% response rate). This revealed an increase (0.9; p=0.034) in aggregate scores on the P3C-OCT between T1 (5.8) to T2 (6.7). This therefore represents a measurable increase in activity towards person centred coordinated care delivery and organisation (see table 2), with a moderate effect size (r=0.42). To determine the specific areas of person centred coordinated care (P3C) that improved during the evaluation, this was examined by domains of P3C[34–36]. When

broken into subdomains of P3C, significant improvements were delivered in areas related to 'Goals and Outcomes' (e.g. goal setting with patients; 1.7 increase, *p*=0.00; large effect size *r*=0.61).

Table 2: Mean changes in P3C-OCT scores between time 1 and time 2 for 36 paired practices. The top row provides the total OCT score (out of a maximum of 20), followed by domains of P3C. The OCT score for each domain is given for time 1, time 2 and the difference between time 1 and 2. The statistical significant of these differences is indicated by *p-value* from Wilcoxon signed rank test. Statistically significant results (at the level p<0.008; corresponding to a Bonferroni adjustment for 6 tests at the p<0.05 significance level) are indicated in bold font and with an asterisk next to the *p*-value. Effect sizes were calculated as test statistic *z* by the square root of the number of pairs.

	Time 1	Time 2	Change T1→ T2 (p-value; effect size)
Total OCT Score:	**5.8**	**6.7**	**0.9 (*p*=0.01; *r*=0.42)***
Information & Communication	7.4	8.1	0.7 (*p*=0.25; *r* =0.19)
Care Planning	6.6	7.2	0.6 (*p*=0.14; *r*=0.25)
Goals & Outcomes	6.1	7.8	**1.7 (*p*<0.001; *r*=0.61)***
Transitions	4.9	5.2	0.3 (*p*=0.43;*r*=013)
Organisational Process Activities	4.3	5.2	0.9 (*p*=0.03;*r*=0.36)
Decision Making	3.8	4.4	0.6 (*p*=0.07;*r*=0.3)

Further to the longitudinal analysis, SPQS practices were also compared to a cohort of 17 non-SPQS practices from the South West (all control practices returned data at Time 2). Aggregate results for the P3C-OCT revealed that control practices had an aggregate score of 6.2 on the P3C-OCT, with no significant difference between SPQS and control practices either before (a score of 5.8 versus 6.2; *p=0.64*) or after (6.7 versus 6.2; *p=0.41*) the intervention.

Discretion from QOF and time savings

When asking SPQS practices to complete the P3C-OCT, we also included a number of additional questions related to the SPQS scheme. We asked SPQS practices a subjective appraisal of time savings (both in GP consultations and administration) from enrolment in the scheme. These are shown in figure 2. More than half (55%) of the practices (28 of 51 practices that completed these questions) agreed that time had been freed up within the 10 minute standard consultation time.

<figure 2 here>

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

With regard to administrative time savings, more than three quarters of SPQS practices (40/51; 78 %) reported administrative (non-consultation time for practitioners) time savings since initiation of the scheme, with just over one third of these practices (14/51; 27%) reporting gains of more than 2 hours per week. For administrators and non-clinical staff, SPQS was reported to free up time for more than 86% (44/51) of practices with only 13 % (7/51) reporting a negligible effect. Free text response boxes confirmed the plans of the STPs (see introduction and Supplementary File 1), stating that efficiency had been leveraged for increased collaborative and federation-level working, including engagement with a number of schemes in Somerset designed to improve person centred and coordinated care e.g. "Better use of Symphony", "Engagement with EPC", "Rural Practice Network", "Health coaches", "Huddles", "P3C relevant training", "Replaced by other work such as Symphony/health coaching etc", "This hasn't shown a reduction in workload but rather a change in workload." In this manner, the time savings leveraged from QOF were not hypothesised to lead to an improvement of experiences for practitioners, but instead a shift in workload.

Retention of QOF elements

When asking SPQS practices to complete the P3C-OCT, we also included a number questions specific to the implementation of SPQS. When asked 'Are you still using components of the QOF?', nearly all practices enrolled in SPQS continued to use at least some aspects of QOF (only 1 out of 51 respondents to this question stated "none"; 86% of practices used "Some", "Most" or "All"). We further investigated the continued utilisation of QOF via a free-text response in the P3C-OCT questionnaire. This revealed that QOF was still (according to one practice) utilised by "applying individually, not 'point scoring'". A common aspect that was dropped was exception reporting, with time also being saved by avoiding "target chasing". Elements of QOF were also contractually retained such as the CQRS (Calculating Quality Reporting System). This remained active under the SPQS contract to allow data on prevalence and key indicators to be collected from practices via GPES (GP Extraction System), where prevalence figures are utilised in the SPQS payments calculation.

QOF also continued to be utilised for the monitoring of LTCs and recall of patients with LTCs for routine check-ups. Around a half of SPQS practices (n=25) still use QOF for recall of at least some (or all) conditions (e.g. checking for recall requirements for patients with LTCs and the management of specific chronic diseases). Free text responses suggested that whilst recall was an essential function, the implementation under QOF was overly burdensome and not tailored for multiple morbidities. Some practices countered this by running in-house developed searches with a priority to "concentrate on an integrated LTC system". This suggests that that there is scope for collaboration to design an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs (as previously proposed[47,48]).

Time Series of Hospital Episode Statistics

Results of the ITS are shown in figure 3. No significant increases were detected in the slope post-intervention (i.e. after the initiation of the SPQS contract in June 2014) in emergency admissions for patients with a primary diagnosis of four ACSCs in SPQS practices. Full results of significance tests are provided in Supplementary File 4. The removal of QOF has had no significant effect on emergency

admissions for these four ACSCs at the time of intervention, or in the two years following. However, for the non-SPQS Somerset practices, a significant slope change (increase) in admissions for AMI and Diabetes was observed, and a significant slope change (decrease) for admissions for Stroke was observed. These changes in admissions are therefore unrelated to the SPQS contract (see discussion below).

<figure 3 here>

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see Supplementary File 4).

DISCUSSION

We observed a variety of responses to de-incentivisation of QOF in Somerset. Some QOF-related components remained mandatory (prevalence reporting). Some 'desirable' features of the QOF system were still used (e.g. prompts during consultation), others were adapted (e.g. patient recall) and some burdensome components dropped altogether (e.g. exception reporting).

Practices reported that these alterations had led to time and resource savings in both GP consultations and administration. These time savings were used to increase involvement in implementation projects such as Symphony Test and Learn, Village Agents, Health connections, and the South Somerset Vanguard. These were planned as part of the SPQS contract and associated ongoing healthcare reforms. These local implementation projects are actively targeting service redesign for complex patient needs, using person centred coordinated care across practice contexts. These projects have involved stronger federation-level agreements and informal networks, increased multidisciplinary team working, reallocation of resources for health care assistants (including Health and Wellbeing Advisors and Health Coaches), nurses and others, single points of access for the patient, shared electronic record systems, increased use of care planning and changes to structure and timings of GP appointments. The results of our longitudinal P3C-OCT survey confirm significant improvements in P3C, suggesting that SPQS has been successful in its stated aims as a system lever for service redesign aimed at the delivery of greater person centred and coordinated primary care.

Whilst there is emerging evidence that P3C approaches can improve outcomes (particularly for complexity/multimorbidity)[36,49], we could not establish that the changes introduced via SPQS are leading to better outcomes for patients. Patient experience is downstream of the organisational changes occurring in Somerset, and any detectable improvement in patient outcomes may be delayed. The results of the patient P3C-EQ experience established a similar experience of care in Somerset compared to the control QOF practices (who represent active, research engaged-organisations, whereas completion of the survey was mandatory for SPQS practices; see methods). Similarly,

comparison of practitioner perspective of P3C to the control group revealed similar experiences in SPQS versus the control practices. These findings are broadly reflective of results from other initiatives, where – for example – patient-centred care for multimorbid patients recently revealed mixed effects on processes of care, but was not associated with measurable improvements in quality of life or other secondary outcomes, with the authors concluding that the initiative "supported changes in organisation more than it supported changing the clinicians' attitudes on which patient-centredness depends." [50]

In reference to disbenefits, we could find no evidence of increased admissions associated with SPQS. However, ITS did establish trend changes in admissions in non-SPQS Somerset practices (e.g. those practices that retained the QOF contract). A significant increase was observed in admissions with a primary diagnosis of AMI and Diabetes, and a significant decrease observed for those with a primary diagnosis of Stroke. It is, however, unlikely that relatively minor changes to QOF in the years 2014/15 and 2015/16 [51,52] have led to these observed trend changes in emergency admission.

Whilst the time series did not establish any disbenefits in SPQS practices, earlier evaluation of SPQS established that deincentivisation of QOF leads to inconsistent recording of QOF data. Subsequently, analysis of QOF scores have little utility in assessing the quality of care in Somerset[31]. This paucity of data represents a major disbenefit of QOF deincentivisation: one of the primary benefits of QOF has been the widespread recording of clinical activities[1] and availability of GP data and research[6,7]. It is not currently clear how 'quality' could be assessed in the post-QOF landscape – a question that has major implications for research, evaluation, healthcare management.

Limitation of the study

The ability to draw firm conclusions from this study were limited by several factors. Due to time and resource pressures on general practice in the UK, we struggled to recruit controls from the within the same county (Somerset) or matched controls from the region. As an alternative, we obtained non-matched controls from the region. These represented a biased cohort of research-engaged practices. We could not detect improvements in experiences of healthcare professionals or patients – this could be because the intervention had no effect on these outcomes, the instruments were not sensitive enough, the controls were unsuitable, or changes to patient/practitioner experiences were somewhat distal to the intervention. A further limitation of the study methods was that P3C-OCT was only administered to control practices at the second time-point, meaning that we cannot determine if significant improvements of P3C-OCT score in SPQS practices might also have been present in controls.

Implications for the future

Whilst previous calls for the removal of QOF in England [53] have not been reiterated, recent policy has moved towards a reformed, streamlined version of QOF [54,55]. With QOF continuing to evolve, lessons from SPQS have implications for UK policy. We have previously made a number of suggestions for the future landscape of QOF[47,48]. These include retaining limited components of QOF (e.g. those elements that are desirable by GPs; "QOF-Lite"), the development of novel systematic data-capture (including GP contact data) or collaboration on an overhauled, integrated recall system that is specifically designed for efficient management of multiple LTCs[47,48]. General Practice, however, is under huge time and resource pressures[56]. Any proposed alternatives will have to fulfil the primary requirements of being a streamlined process for supporting coordination of care, especially for those

with complex health needs. The recent national review of QOF concluded that QOF should be reformed to become more person-centred, create space for professionalism and optimally impact wider population health and system resource utilisation[57].

FIGURE LEGENDS

Figure 1: Our P3C mixed methods evaluation framework for SPQS2.

Figure 2: consultation time savings (top left), administrative GP time savings (top right) and non-GP administrative time savings (bottom left). Percent responses for 51 practices enrolled in SPQS

Figure 3: Results of interrupted time-series analysis. The four graphs show the ITS for the four ACSCs (from left to right, top to bottom, the graphs are: Acute Myocardial Infarction (AMI), Chronic Obstructive Pulmonary Disease (COPD), Diabetes and Stroke). Data starts at April 2011 and ends at Jan 2017. The SPQS contract was live from June 2014 (i.e. intervention start time, indicated by vertical dashed line). Y-axis gives the number of admissions, normalised as admissions per month per practice. Black circles indicate the average number of emergency admissions in each month for SPQS practices; white circles are average admissions for QOF Somerset practices. The Regression lines pre- and post-intervention are shown unbroken (for SPQS) and dashed (for QOF Somerset practices). All changes between pre- and post-intervention between SPQS and QOF practices are non-significant (see Supplementary File 4).

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DATA SHARING STATEMENT

All data relevant to the study are included in the article or uploaded as supplementary information.

COMPETING INTERESTS

None declared.

ETHICS AND FUNDING

Ethical clearance was obtained from the Plymouth University Ethics Committees (FREC). All participants were given an information pack about the study, and gave informed consent.

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CONTRIBUTIONS

J Close corresponded with partaking practices, collected data, analysed data and compiled manuscript.

B Fosh input, validated and analysed data.

H Wheat corresponded with partaking practices and collected data.

J Horrell corresponded with partaking practices and collected data.

W Lee supported the Interrupted Time Series analysis.

R Byng aided study design and conception.

Bainbridge M corresponded with partaking practices and data collection.

L Witts helped with study design, data collection and corresponded with partaking practices.

R Blackwell collected and analysed data for Hospital Episode Statistics.

L Hall corresponded with partaking practices and collected data.

Lloyd H designed and oversaw the study from inception to completion.

All authors read, contributed to and approved the manuscript.

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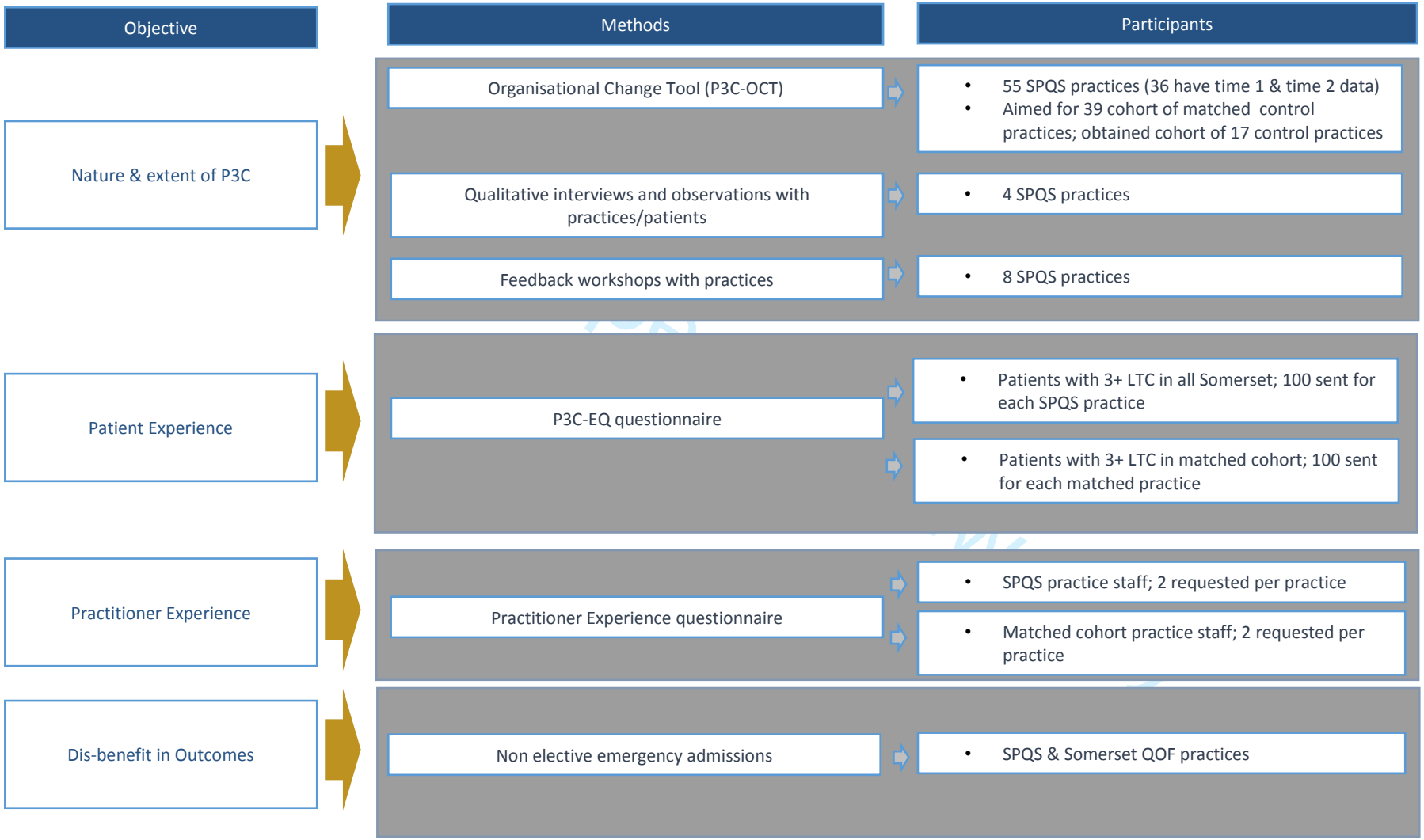
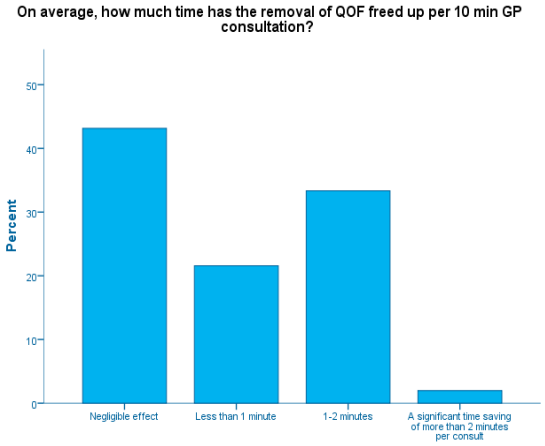
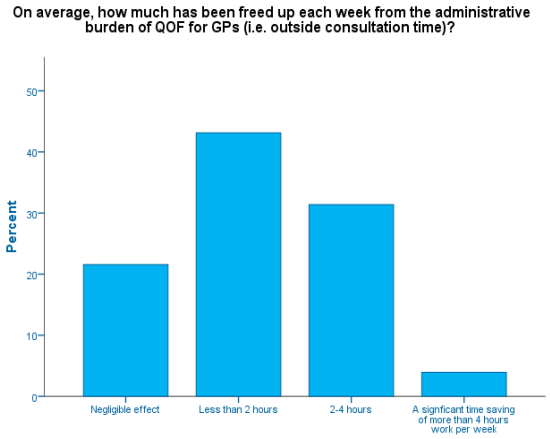
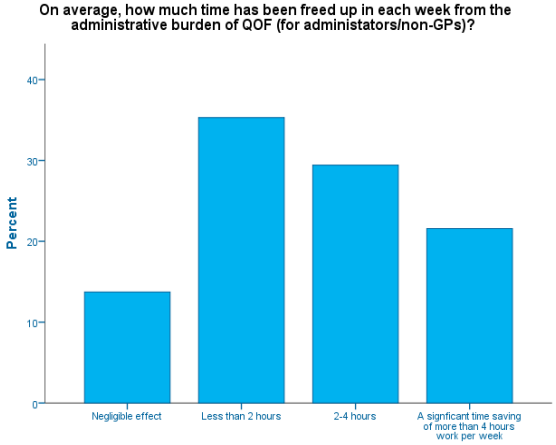
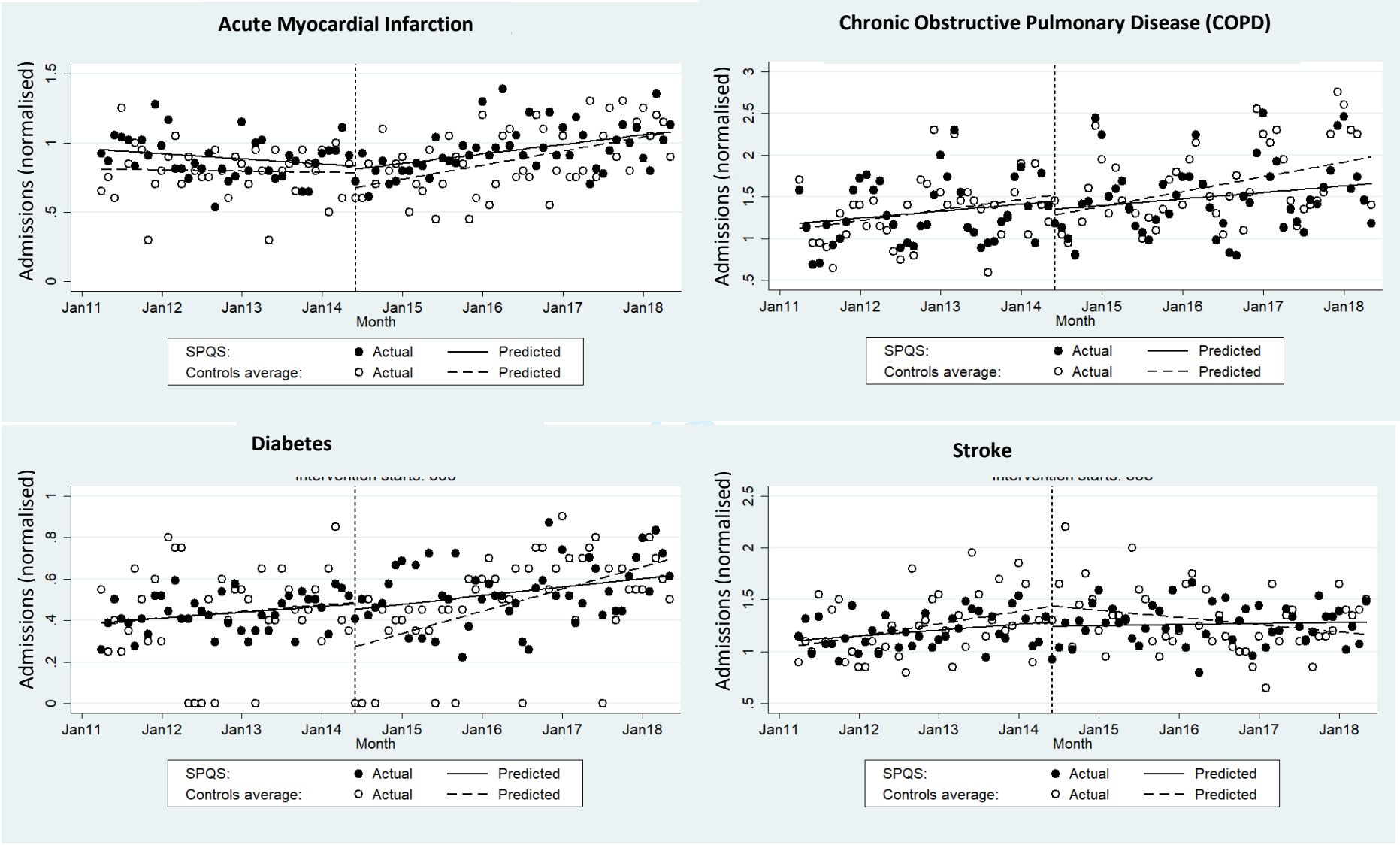

Objective
Methods
Participants
Nature & extent of P3C
Organisational Change Tool (P3C-OCT)
55 SPQS practices (36 have time 1 & time 2 data)
Aimed for 39 cohort of matched control practices; obtained cohort of 17 control practices
Qualitative interviews and observations with practices/patients
4 SPQS practices
Feedback workshops with practices
8 SPQS practices
Patient Experience
P3C-EQ questionnaire
Patients with 3+ LTC in all Somerset; 100 sent for each SPQS practice
Patients with 3+ LTC in matched cohort; 100 sent for each matched practice
Practitioner Experience
Practitioner Experience questionnaire
SPQS practice staff; 2 requested per practice
Matched cohort practice staff; 2 requested per practice
Dis-benefit in Outcomes
Non elective emergency admissions
SPQS & Somerset QOF practices







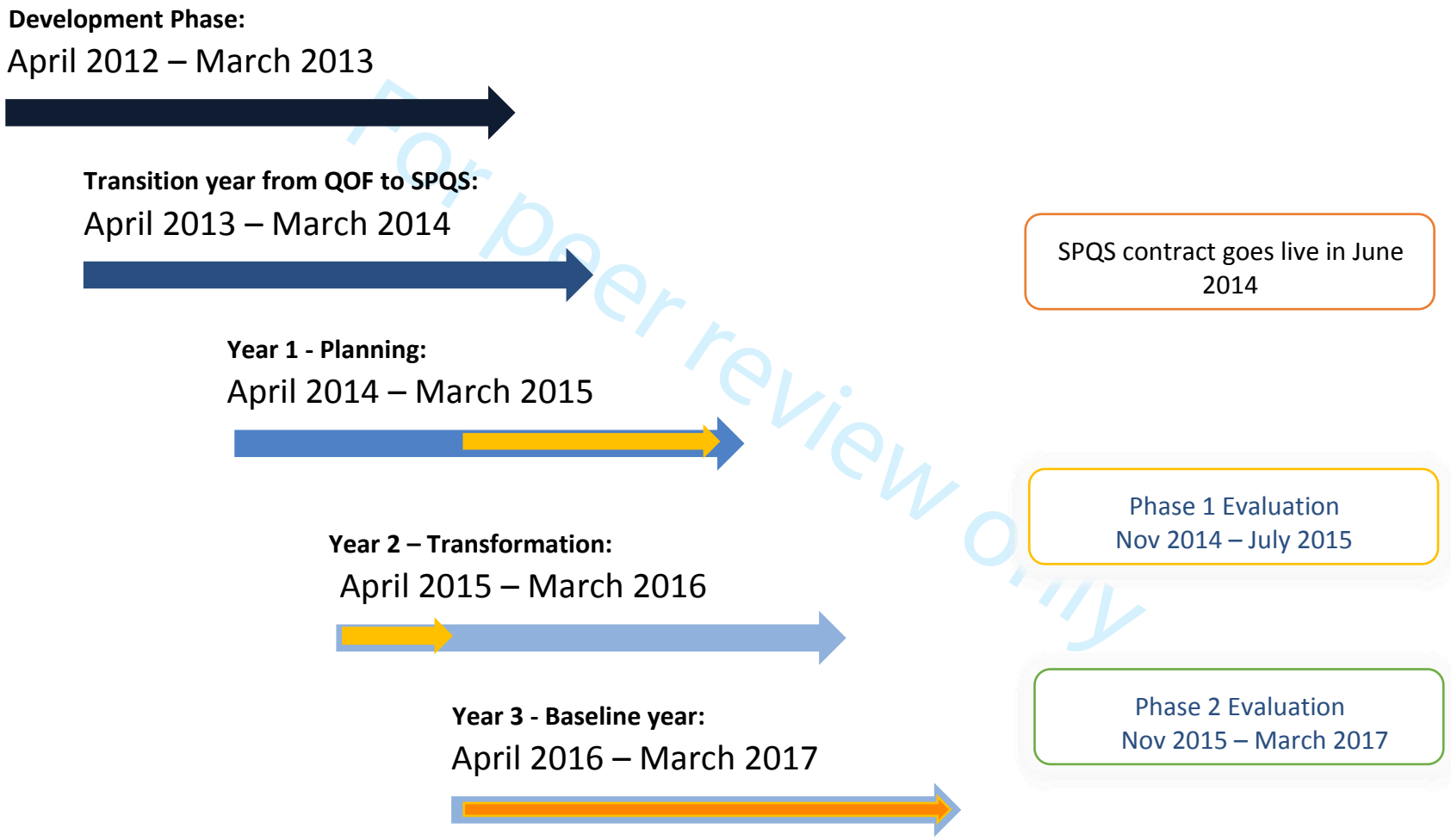

Acute Myocardial Infarction
Admissions (normalised)
0
.5
1
1.5
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Chronic Obstructive Pulmonary Disease (COPD)
Admissions (normalised)
.5
1
1.5
2
2.5
3
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Diabetes
Admissions (normalised)
0
.2
.4
.6
.8
1
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted
Stroke
Admissions (normalised)
.5
1
1.5
2
2.5
Jan11
Jan12
Jan13
Jan14
Jan15
Jan16
Jan17
Jan18
Month
SPQS:
Actual
Predicted
Controls average:
Actual
Predicted

Supplementary File 1: Overview of Sustainability and Transformation Plan (STPs) for 28 of 55 practices (anonymised) enrolled in SPQS; with 2 further STPS completed at federation level.

Activities:	TOTAL for each activity (from a total of 30 STPs):	Practice 1	Practice 2	Practice 3	Practice 4	Practice 5	Practice 6	Practice 7	Practice 8	Practice 9	Practice 10	Practice 11	Practice 12	Practice 13	Practice 14
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	20 (66.6%)	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Continued/increased involvement in Mendip Your Health & Wellbeing	5 (16.7%)	✓					✓		✓	✓		✓			
Use/development of technology to assist self-management	3 (10%)		✓		✓										
Increased use of Health Connectors Mendip	4 (13.3%)		✓				✓			✓	✓				
Investing time in community engagement	2 (6.7%)		✓												
MDTs in care coordination hubs	1 (3.3%)		✓												
MDTs with district nurses at palliative care reviews (weekly)	1 (3.3%)		✓												
Engagement in compassionate communities and network mapping	1 (3.3%)		✓												
Increased or continued participation with Symphony	12 (40%)				✓		✓	✓	✓	✓		✓			
Possible division of urgent and routine care & formation of urgent care hub	6 (20%)				✓		✓		✓				✓	✓	
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)	17 (56.6%)		✓	✓	✓				✓	✓		✓		✓	
Consideration of practice merger	7 (23.3%)				✓		✓	✓	✓	✓					
Training & upskilling	5 (16.7%)									✓					
Engagement in Somerset together programme	1 (3.3%)											✓			
Development of personalised care planning	1 (3.3%)											✓			
Telephone consultations/ telemedicine	2 (6.7%)														
Use of health coaches	9 (30%)														
Engagement in Living Better programme	1 (3.3%)														

	Practice 15	Practice 16	Practice 17	Practice 18	Practice 19	Practice 20	Practice 21	Practice 22	Practice 23	Practice 24	Practice 25	Practice 26	Practice 27	Practice 28	Federation 1	Federation 2
Collaborative working with other practices (e.g. sharing workforce, resources etc.)	✓	✓	✓									✓	✓	✓	✓	✓
Continued/ increased involvement in Mendip Your Health & Wellbeing																
Use/development of technology to assist self-management															✓	
Increased use of Health Connectors Mendip																
Investing time in community engagement												✓				
MDTs in care coordination hubs																
MDTs with district nurses at palliative care reviews (weekly)																
Engagement in compassionate communities and network mapping																
Increased or continued participation with Symphony					✓	✓	✓				✓		✓	✓		
Possible division of urgent and routine care & formation of urgent care hub																✓
Coping with staff resourcing issues via new ways of working (e.g. pharmacist, paramedics, GP training)	✓	✓	✓	✓		✓		✓	✓	✓			✓			✓
Consideration of practice merger											✓					✓
Training & upskilling	✓	✓	✓	✓												
Engagement in Somerset together programme																
Development of personalised care planning																
Telephone consultations/ telemedicine	✓	✓														
Use of health coaches	✓	✓				✓		✓	✓	✓		✓	✓	✓		
Engagement in Living Better programme																✓

Supplementary File 2: Timeline of SPQS scheme and evaluation.



1

Full results of P3C-Practitioner questionnaire

Selection of P3C-Practitioner

The P3C-practitioner was selected for this study by initially conducting a scoping review to identify measures that included aspects of professional experiences of integrated/coordinated care. This identified 33 measures, four of which were deemed relevant (Safety Net Medical Home Provider Experience Survey; Person-Centred Health Care for Older Adults Survey" (PCHCOA) – which we refer to as the "P3C-practitioner"; Staff Questionnaire - Integrated Care Evaluation Pilots; North West London Integrated Care Pilot - Practitioner Survey). These measures were then presented to workshop attendees (healthcare professionals; managers; senior NHS England representatives; local commissioners; academics) to explore the strengths and weaknesses in terms of applicability and utility as part of routine data collection in respective settings. The PCHCOA was selected due to its established psychometric properties (Briony Dow et al., *Development and initial testing of the Person-Centred Health Care for Older Adults Survey*, 25 *International Psychogeriatrics* 1065–1076 (2013)), its good coverage of domains of P3C and a positive response at the feedback workshop. For the purposes of this evaluation, we have renamed the instrument the P3C-practitioner.

Scoring of P3C-Practitioner

Whilst previously validated, the authors did not develop an aggregate scoring mechanism for the instrument. Therefore, we generated summary scores by simple addition from the 4-point Likert scale (Never = 0; Rarely = 1; Sometimes = 2; Usually = 3; Always = 4). This allowed us to compare aggregate scores to compare SPQS versus controls over all 29 questions (see table below), with significance tested using MWW test. We also generated sub-scales by addition of question relevant to this aspect of P3C (see following page for questions). No significant differences were detected in practitioner experiences in SPQS or control practices, for either mean scores or the following subscales.

Sub-Scale: Person Centred Care = Questions 1.1, 1.3, 1.4, 2.1, 2.2, 5.1, 6.1,6.2,6.3, 7.1, 7.2, 7.3, 8.1 8.2 and 8.3.

Sub-Scale: Coordinated Care = Questions 4.1, 4.2, 4.3

Sub-Scale: Working Environment = Questions 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7

	QOF	SPQS	Sig. (2-tailed)
Mean Score	**83.79 (n=29)**	**86.18 (n=98)**	**.4**
Sub-Scale: Person Centred Care	47.62	49.11	.35
Sub-Scale: Coordinated Care	7.41	8.38	.12
Sub-Scale: Working Environment	22.03	21.11	.24

P3C-Practioner instrument

Q1.1 In my work area, service users / patients have an equal say with the rest of the team in the development of the support plan.

Q1.2. In my work area, service users / patients and carers have an equal say with the rest of the team in the development of the discharge plan or exit strategy from the service.

Q1.3. My/our support plans are structured around the service user's/patient's goals.

Q1.4. Where I currently work, we provide services in the location that best suits the needs and preferences of the service user/patient and their carers.

Q2.1. I ask service users/patients what their goals/needs are for their health and wellbeing.

Q2.2 I ask the carer/s what their goals/ needs are for the health and wellbeing of the person they support.

Q3.1. I am supported to develop the skills I need to work with the service user/patient and their carers.

Q3.2. Where I am currently working, I have been exposed to good role models in care/support for service users/patients.

Q3.3. Expectations of my role and how I treat the service users/patients I support are communicated clearly and consistently.

Q3.4. I feel that I work as part of a team with a recognised and valued contribution.

Q3.5. The emotional and physical demands of my work are acknowledged and recognised.

Q3.6. I feel that I am able to fully use my skills in my work with the service users/patients

Q3.7. My work environment values the care/support I provide to the service users/patients.

Q4.1. It is clear to the service user/patient or their carer who their key worker is.

Q4.2. The service user/patient and their carer have ready access to a key identified person (i.e. they are available by phone, messages are returned promptly).

Q4.3. Where I currently work, we know how to direct the service user/patient to the most appropriate service without them having to make another call (single point of contact).

Q4.4. After the service user/patient is discharged/leaves the service, they receive a follow-up phone call or visit.

Q5.1. Where I currently work, adequate transport and parking are provided to ensure access for service users/patients and their families/carers.

Q5.2. Where I currently work, service users'/patients' personal privacy is respected.

Q6.1. I am able to meet the communication needs of service users/patients and their carers when working with them.

Q6.2. Written materials are provided by my place of work to service users/patients and their carers in a language they can understand.

Q6.3. Information is provided in a variety of ways to ensure all service users/patients and their carers have access (e.g. written, verbal, visual).

Q7.1. I welcome it when service users/patients are informed and question or challenge my advice.

Q7.2. The needs and preferences of service users/patients should be central in all services.

Q7.3. I like working with the service users/patients I support or care for.

Q8.1. It is an important part of my job to get to know my service user/patient (e.g. call them by their preferred name, remember and repeat something they have told me).

Q8.2. I give service users and their carers adequate time to talk to me (e.g. to discuss their concerns and their expectations).

Q8.3. I seek to find out what is important to service users/patients about their health and wellbeing (e.g. mobility, cognitive function, being part of the family, able to go to the gym).

Supplementary File 4: Results of interrupted time-series analysis for emergency admissions on four long-term, ambulatory care sensitive conditions (ACSCs). Full results are provided, although the most relevant statistical tests (column "P>|t|") are for the rows:

"_z_x659" the difference between the changes in intercept for SPQS and QOF pre/post intervention)

"_z_x_t659" the difference between the changes in gradient for SPQS and QOF pre/post intervention.

All are non-significant, revealing no excess increases in emergency admissions in SPQS practices for these four ACSCs after the implementation of the SPQS scheme. Significant differences were observed, however, for changes in the *control* slope and/or intercept pre/post intervention for Acute Myocardial Infarction, Stroke and Diabetes . These are highlighted in red below.

Acute Myocardial Infarction (AMI)

		Newey-West				
Description	**PRIM_AMI**	**Coef.**	**Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**
Pre-intervention control gradient	_t	-.0007003	.0025541	-0.27	0.784	-.0057435 .0043429
Difference between control/SPQS pre-intervention intercepts	_z	.1396686	.0801094	1.74	0.083	-.0185102 .2978475
Difference between control/SPQS pre-intervention slopes	_z_t	-.0024182	.0034503	-0.70	0.484	-.009231 .0043946
Change in control intercept	_x653	-.1043759	.0677199	-1.54	0.125	-.2380911 .0293393
Change in control slope	**_x_t653**	**.0091594**	**.0030779**	**2.98**	**0.003**	**.0030819 .0152369**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.0853708	.0946241	0.90	0.368	-.1014677 .2722093
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0003106	.0040914	-0.08	0.940	-.0083892 .0077679
Intercept of control pre-intervention	_cons	.8103239	.0652408	12.42	0.000	.6815037 .9391441

Chronic Obstructive Pulmonary Disease (COPD)

Description	PRIM_COPD	Newey-West Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0105427	.0048903	2.16	0.033	.0008867	.0201988
Difference between control/SPQS pre-intervention intercepts	_z	.0619958	.1748488	0.35	0.723	-.2832492	.4072408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0035803	.0077243	-0.46	0.644	-.0188323	.0116717
Change in control intercept	_x653	-.2382072	.1889151	-1.26	0.209	-.6112265	.1348121
Change in control slope	_x_t653	.0041691	.0078257	0.53	0.595	-.011283	.0196211
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.1413474	.2797523	0.51	0.614	-.4110331	.693728
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0046434	.011329	-0.41	0.682	-.0270129	.0177261
Intercept of control pre-intervention	_cons	1.122065	.1089517	10.30	0.000	.9069359	1.337194

Stroke

Description	PRIM_STRK	Newey-West Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0100503	.0041188	2.44	0.016	.0019176	.0181831
Difference between control/SPQS pre-intervention intercepts	_z	.0528715	.0954745	0.55	0.580	-.1356461	.2413891
Difference between control/SPQS pre-intervention slopes	_z_t	-.0053472	.0047727	-1.12	0.264	-.014771	.0040765
Change in control intercept	_x653	-.0003719	.1374057	-0.00	0.998	-.2716843	.2709404
Change in control slope	**_x_t653**	**-.0158336**	**.005394**	**-2.94**	**0.004**	**-.0264841**	**-.005183**
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	-.0449425	.1616696	-0.28	0.781	-.3641647	.2742798
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0119868	.0062141	1.93	0.055	-.0002831	.0242568
Intercept of control pre-intervention	_cons	1.05749	.0852406	12.41	0.000	.8891793	1.2258

Diabetes

Description	PRIM DIAB	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0025823	.0026916	0.96	0.339	-.0027323	.0078969
Difference between control/SPQS pre-intervention intercepts	_z	.0005698	.0759019	0.01	0.994	-.1493012	.1504408
Difference between control/SPQS pre-intervention slopes	_z_t	-.0001994	.0029745	-0.07	0.947	-.0060726	.0056738
Change in control intercept	**_x653**	**-.2114749**	**.0751425**	**-2.81**	**0.005**	**-.3598463**	**-.0631036**
Change in control slope	_x_t653	.0063408	.0033715	1.88	0.062	-.0003164	.012998
difference between the changes in intercept for SPQS and QOF pre/post intervention	**_z_x653**	**.1864524**	**.0866148**	**2.15**	**0.033**	**.0154285**	**.3574763**
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	-.0052892	.0038335	-1.38	0.170	-.0128586	.0022802
Intercept of control pre-intervention	_cons	.3890688	.0704267	5.52	0.000	.2500088	.5281288

Combined (AMI/COPD/Stroke/Diabetes

Description	SECD_AMI	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
Pre-intervention control gradient	_t	.0224751	.0064245	3.50	0.001	.0097898	.0351604
Difference between control/SPQS pre-intervention intercepts	_z	.2551058	.227217	1.12	0.263	-.193542	.7037535
Difference between control/SPQS pre-intervention slopes	_z_t	-.0115452	.009923	-1.16	0.246	-.0311385	.0080482
Change in control intercept	**_x653**	**-.5544301**	**.2489365**	**-2.23**	**0.027**	**-1.045964**	**-.0628964**
Change in control slope	_x_t653	.0038357	.0103935	0.37	0.713	-.0166866	.024358
difference between the changes in intercept for SPQS and QOF pre/post intervention	_z_x653	.3682284	.3741294	0.98	0.326	-.3705031	1.10696
difference between the changes in gradient for SPQS and QOF pre/post intervention	_z_x_t653	.0017436	.0148231	0.12	0.907	-.0275252	.0310124
Intercept of control pre-intervention	_cons	3.378947	.1531439	22.06	0.000	3.07656	3.681335

STROBE Statement—checklist of items that should be included in reports of observational studies

	PAGE/LINE NUMBER IN MANUSCRIPT	Recommendation
Title and abstract	p2	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	P3-5	Explain the scientific background and rationale for the investigation being reported
Objectives	L126-132	State specific objectives, including any prespecified hypotheses
Methods		
Study design	L135-145	Present key elements of study design early in the paper
Setting	Setting L135-145; dates L210-217	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	L148-168	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	L169-198	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	L169-198	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	L158-161	Describe any efforts to address potential sources of bias
Study size	L149-151	Explain how the study size was arrived at

Quantitative variables	L209-235	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	L209-235	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses

Continued on next page

Results		
Participants	L239-247	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	Table 1	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	L239-282	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	L239-357	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	N/A	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	L360-397	Summarise key results with reference to study objectives
Limitations	L405-413	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	N/A	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	N/A	Discuss the generalisability (external validity) of the study results
Other information		
Funding	L451-6	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.