Supplementary file 1: Information on GP clusters

GP clusters replaced the Quality and Outcomes Framework (QOF) pay-for performance programme, which had been active throughout the UK since 2004, as the prevailing primary care quality improvement approach in Scotland. The latter was abolished in Scotland in 2016 in response to growing concerns over undesirable levels of bureaucracy and a disproportionate biomedical focus, at the expense of holistic, individualised patient care.[31]

QOF however remains in place in England under the General Medical Services (GMS) contract, as a voluntary annual reward scheme aiming to incentivise quality of care by linking a proportion of practice income to performance against pre-specified 'indicators'. These indicators span a range of clinical (e.g heart failure, diabetes mellitus, COPD), and public health (e.g child health surveillance, immunisation, cervical screening) domains. An additional 'quality improvement' domain is updated annually, which recognises engagement in QI activities relating to key topic areas identified to require focus each year. The two topic areas identified for 2020/21 are supporting people with learning disability and early diagnosis of cancer.[32]

The concept of GP clusters can be traced back to theory and practice of 'quality circles' which have long since been established within primary care across Europe and in Canada.[6,9] Previous research has supported the benefit of quality circles with regard to costs, ordering of tests, prescription habits, adherence to clinical practice guidelines, and patient outcomes.[33] Clusters comprise geographical groupings of 5-8 GP practices, each of which are represented at periodic meetings by a nominated Practice Quality Lead (PQL), that work collaboratively to engage in peer-led quality improvement activity relevant to their local population.[4] Each GP Cluster of PQLs has an identified Cluster Quality Lead

(CQL), responsible for providing a leadership role in coordinating quality improvement activities both within, and on behalf of, their GP Cluster, and for liaison with relevant locality and professional organisations.[4,5]

This restructuring complemented the introduction of a new GP contract which came into force in 2018, and through which the role of GP Clusters in was more firmly embedded in the context of wider transformations in Primary Care.[7] Additional developments included expansion of the primary care multi-disciplinary team (MDT), with additional clinical input from advanced nurse practitioners, pharmacists and allied health professionals (including advanced physiotherapists, primary care mental health workers, and in some areas link workers), and the integration of health and social care.[4]

The move to cluster working was intended to shift the focus of primary care QI from the externally-driven, incentive-based methodology embodied by the QOF, to a locality-based approach encouraging independent collaboration and providing a degree of local autonomy.[4] This alternative approach was felt to better align with the core values primary care by allowing for clinically-led QI efforts centred around provision of holistic care.[7,8] In addition, it was hoped that a quality framework that was contextualised locally would be better geared towards tackling ongoing socio-economic inequalities in health status and health outcomes across Scotland.[4,35]

These aspirations for GP cluster working are set out in the 'Improving Together' framework, published in January 2017 , which outlines the Scottish governments vision for the evolution of primary care QI in a post-QOF landscape.[4] This framework defines clearly the intended functions of GP clusters, which can be subdivided into intrinsic (i.e improving quality of care in and between practices within the cluster) and extrinsic (i.e contributing to improving the quality of wider integrated health and social care services provided to patients registered within their locality) roles. Fulfilment of this latter role requires engagement of CQLs with established medical advisory structures through

participation in a 'tripartite' collaboration with the GP Subcommittee of the Area Medical Committee and local NHS Board/Integration Authority.[5]

Supplementary file 2

Table S2.1: Comparison of views on provision of key external support for clusters in 2016 and 2021

	2016	**2021**
Data analytic support	Locally deployed data analysts provided by LIST were seen to have "*a very major potential role in making clusters work by helping get the right sort of data"[P2].* Data support was seen as central to enabling the success of clusters in Inverclyde: *"they had data support from LIST, they had a very engaged Public Health consultant, and a very engaged senior manager at IJB level. So they were getting the data support, Public Health and LIST, they were getting good managerial support and they were getting additional administrative support. So I think it would be difficult to say, to extrapolate from that [to clusters elsewhere" [P2]* ***(Q1)*** Funding for Inverclyde clusters to employ a LIST analyst and input from a Public Health consultant, both of whom *"at the outset… were suggesting what data to look at…was very helpful"[P6]* From the perspective of a LIST analyst involved in supporting clusters in Inverclyde, the use of data was seen as fundamental; the *"nuts and bolts"* to the design of QI projects (tests of change), in order to: *"make sure that … what they've got is measurable and providing meaningful things out of the other side"*	A LIST analyst interviewed highlighted the challenges of local collaborative working alongside clusters: *"in some of the areas we had to step back… and not provide support because… we were seen as individuals that were there to come and take their jobs…So we had to step away to allow [HSCPs] to go through their organisational design and set up. And that took more than a year from some areas"[SH06] ,* noting that this created a significant delay in access to data support for clusters in these areas. Support in the form of efficient provision of manageable data for cluster use was seen to be crucially lacking: *"the list data analysts, I wasn't impressed that they were getting the information through that we were wanting….the idea that the clusters should come up with an intrinsic idea that they want to look at diabetic care HbA1cs across all the practices in a cluster, and they put in a request, and two weeks later they get some nice printout with…so you can compare what you're doing. I don't think that was happening."[SH03]*

	Support from LIST was therefore vital, in order to enable clusters to engage meaningfully with the data by sourcing *"accurate and usable data"* and by *"making it as simple as possible to have workable data…that GPs…and clusters can use".* He alluded to what this would mean in practice: *"what I'm going to do is put it into some sort of manageable form. Some sort of easily readable document and send it on to them"[P9].* Additionally, he emphasised the importance of building local collaborative relationships to facilitate this role: *"the links between the role that I have and the Cluster Quality Leads… or whoever is working within the clusters has to be kind of there. There has to be some sort of relationship there, and whether that's getting out and about to meet with cluster leads, Practice Quality Leads as well. I that's probably something that has to be done."[P9]*	In addition to LIST support, the need for better support from public health to help clusters engage meaningfully with data was emphasised, in relation to fulfilment of both their intrinsic and extrinsic functions: *"the external role…requires a lot of data... a lot of work with public health…my hope would be that you'd have Public Health Scotland having more public health clinicians working… at ground level, if you like, rather than, you know, high up in the sky level… actually, working alongside CQLs, and providing them with resource, and data, and supporting them in working out what they want to do, and how they want to do it" [SH01]* *"The intention was always that clusters would set their own agendas based on their own population needs. But even that is difficult to do…unless you have good support. And then from Public Health to understand your data, how they understand where the problems lie. How do you create a project that is meaningful, how do you analyse it? And how do you then make improvements?"*
Administrative support	Administrative support was highlighted as "*essential*", with the potential to *"shorten the time to an outcome if its focussed in the right way"[P3]*	Not focused on in great depth; one stakeholder noted that clusters were *"limited in their admin support."[SH02]*
Training	In the aftermath of the QOF, GPs were perceived as being "*completely de-skilled in working out quality improvement locally"[P2].* This was noted amongst Inverclyde clusters: *"there has been reluctance on the part of some GPs to engage fully with what has been asked of them…That's maybe going back to the QI training and the Quality Improvement techniques, …some of them I think do want to just jump to the end and say that this is what we want to introduce without actually going through that process of examining what the*	Complaints about the lack of adequate training for PQLs and CQLs prevailed in 2021: *"Surely to be that lead within the system…you have to have undertaken one of the lead level quality improvement courses. So you need a bit of expertise in quality improvement. Our cluster quality leads, you don't. How can we even…? Those are basic things that we would want to support those CQLs to do, to undertake. So there's a*

	situation is…but that's the way that things have been set up – to go through that QI process, and I don't think that everybody fully engaged with that"[P9]. Although the QI training they had received was felt to have gone some way to improving this: "*I think that the QI training that most, if not everybody that was in the practices went on has probably been a big help to me because I think it's enabled people who might not be used to that sort of way of thinking or way of looking at things that it gives them a background in this is how you do it and maybe it gets them thinking about things such as data and measurement and things that they might not normally think of, that they're able to take forward"[P9]* There was widespread recognition amongst the stakeholders of the need for "*formal training programmes"[P3]* to support PQLs and CQLs in fulfilling their roles effectively, as clusters were to be rolled out across the country : "*Clusters clinical leads will need to be upskilled to be able to undertake their role effectively [most likely in the form of]…national support around quality improvement …(support from NES and HIS is required)"[P5]* *"training in Improvement Science, quality improvement techniques…. locally and nationally [will be needed]"[P2]*	*safety and quality fellowship run by NES and it's three weeks residentials and a trip to the quality forum. It's not set up for GPs. GPs can't take…as independent contractors, they can't take a week out to go away and attend a course, never mind doing that three times a year. So there's something about actually just the basic infrastructure of those quality lead posts that were set up and established to help them in undertaking… how they would even begin to undertake a quality improvement course"[SH05].* This was associated with a perception of a lack of aptitude for QI amongst GPs (echoing those comments made in reference to the Inverclyde clusters in 2016): "*we're good at coming up with ideas and we're good at coming up with projects. We're not very good at evaluating them or collecting data well or knowing what to do with it, because it's not really part of our training"[SH02]* A stakeholder working as a GP in Edinburgh noted that Edinburgh HSCP had in fact provided some support in this regard: "*Edinburgh has been not bad at that, because they've got the Quality Academy. And actually, Edinburgh's Health and Social Care Partnership, for instance, said any cluster leads, or cluster person, GP, that wants to go to the Quality Academy, they would help support that, and pay for that*"[SH01] Though was not convinced that this was consistent across the country:

		"*I think the clusters have been variable, but I think a lot of them have struggled with having enough support, and time, and training."[SH01]*
Project support	*"GPs in general practice haven't ever worked with quality improvement to that extent… we have to support that with em … with em … learning, so RL, who is an improvement guru from down south, has been up [to Inverclyde] on a couple of occasions to support the practices with improvement"*	*"So there's a real need for better sharing of learning, more administrative and project support"[SH02]*
Funded time		Protected time allocated for for PQLs and CQLs to engage in cluster work was felt to be inadequate: "*one session a week is just not going to cut it. It's not going to be possible to do the operational roles and the strategic roles in a meaningful way with that level of resource"[SH02]."****(Q2)***

Supplementary file Table S2.2: Comparison of views on engagement between HSCPs and clusters in 2016 and 2021

2016	**2021**
The likelihood of success of extrinsic cluster working was felt to be conditional upon good engagement between clusters and HSCPs: "*it takes two to tango so you need both the NHS externally to want to play with the GPs and vice versa…A lot will depend on the extent to which Government makes it clear that IJBs have to prioritise engagement with General Practices… And I suspect what will happen is that it will vary across the country, depending upon prior relationships" [P2]* Participants involved in the Inverclyde pilot acknowledged that the relative ease of establishing collaborative working observed in that area was likely aided by the already established local infrastructure in Inverclyde: *"they have a good structure around it… "small partnerships, quite integrated before". [P6]* *"It struck me that there were good prior relationships between the IJB and the GPs, they had very good collaborative leadership from the GPs"[P3]* As such, it was recognised that, in most areas (where such integrated ways of working had not formerly existed), a significant period of adjustment would be required to establish effective collaborative leadership: *"we want a meaningful and mature relationship and dialogue [with clusters]…So, we have very clearly and emphatically said that the first 2*	The local success of the reforms at large was seen to be chiefly dependent on local leadership and facilitation from the health boards and HSCPs, which appeared inconsistent across the country: *"when you get into little disputes and the people don't see eye to eye it can very often result in very slow progress in terms of what we're trying to do… it works when you get people with like-mindedness, and if you get a personality clash then the whole thing starts to go very slowly."[SH03]* The engagement between HSCPs and GPs was felt to be crucial: "*I think if you've got a good HSCP, that is primary care, GP facing, and primary care facing, and not all of them are, then it's got the potential to work well" [SH01*] And was perceived as variable, based on pre-existing relationships: "*I think one of the reasons why locally it's been so diverse is because of some…a lot of the work that's gone well has been built on existing relationships. And where it hadn't existed, it's been a little bit more challenging" [SH06]*

years of clusters is about relationship building because if you don't build relationships then whatever then follows is probably not going to work"[P3]	

Supplementary file Table S2.3: Comparison of views on sharing of learning between clusters in 2016 and 2021

2016	2021
Sharing of experiences, both successful and challenging, between clusters operating in different areas was seen to be of central importance, especially within the initial development phase of their implementation: *"if you've got people saying, 'actually, come on guys we've had a cluster on this patch for a year and a half we've been doing this, this and this…this is what it feels like, and looks like, we think it's great' and that's fellow professionals saying to other professionals then that's incredibly powerful" [P3]* *"[future cluster work should involve] sharing of best practice, learning from what doesn't work" [P5]* There was clear recognition of the need to harness learning from the pilot of cluster working carried out in Inverclyde to inform the implementation of clusters across the country: *"that's all been a bit back to front [in Inverclyde]…that's going to be the reality and that's what's going to happen with clusters going forward, so if we can take that learning and then make the changes before any other clusters form, or share that learning with other clusters, which we're hoping to do, then hopefully…some of the problems or some of the problems won't be repeated" [P8].* *"I'm sure that there are ideas and issues that have cropped up as a result of doing this [work in Inverclyde] that would be able to be*	Stakeholders in 2021 perceived a "huge gap" in the absence of "*opportunities to really see and to bring clusters together and to see what data's been captured across different clusters and what improvements they're making and for clusters to be able to share with other clusters what that area is"[SH05]:* *"there's been a lack of sharing of learning across clusters, across the country, in terms of people being able to easily access projects that have worked well in some parts of the country that could be replicated elsewhere" [SH02]* *" there's not been any additional infrastructure put into health and social care partnerships to really support the changes and sharing across practices and clusters"[SH05]* In light of GPs feeling "*a bit rudderless"[SH03]* in the post-QOF world, it was felt that "*there would be a huge amount of gratitude… from general practice, if there was more sharing of good practice"[SH02].* This failure to share learning was seen as a contributing factor to the unwarranted variation in cluster working across the country, as well as the overall slow rate of progress perceived in 2021 : *"we need to review where we are and work out why some areas have progressed better than others, and they need to learn from the areas that are doing well, and the areas that are doing less well"[SH03]*

done and maybe change the things that are done in other places." [P9]	One participant referenced the failure of the early work done in Inverclyde in this capacity: *"when I go back five or six years and I think of the… testing around about some of the reforms that went into the GMS contract and the Memorandum of Understanding. I think there could have been so much more and better use of that piece of money and testing…Scotland is a tiny country and for all these tests of change there was no sort of national process as they were being implemented to share the learning. I think that in many ways would have then rapidly helped us"*.(despite this being rcognised as important in 2016). One stakeholder however, felt that the problem lay not with external facilitation of opportunities for sharing between clusters (as was the prevailing view): *"we're not short of hearing stories and sharing great practice….there's been really specific pieces of work where GPs and practices in primary care have reached out to different parts of the system to bring in either professionals or other leaders to think about, how do we reel in resources, how do we reel in budgets et cetera…. and they've been shared…there's lots that we have been able to share collectively", but rather with the operationalisation of this insight within the clusters: "what I'm not confident in…how much of that has been looked at and then transferred and, let's do this, let's do this as well in our area."[SH06]*

Supplementary file Table S2.4: Views on the wider context of cluster work

	2016	2021
Alignment of clusters with wider primary care reforms	With the new GMS contract being under negotiation at the time of interview, there was recognition amongst the participants that the move to cluster working would not be occurring in isolation but rather, within the context of the accompanying primary care reforms being proposed. Most stakeholders were of the opinion that clusters would complement these wider changes, particularly in relation to the expansion of the primary care multidisciplinary team (MDT).	Despite a recognition that *"key outcomes for clusters was to support GPs in their role as clinical leads within this expanding system and multi-disciplinary team" [SH05*], responses from stakeholders suggested that clusters had not complemented the accompanying primary care reforms, and vice versa, as was initially hoped.

	Clusters were perceived to align well with the principles of multidisciplinary working within general practice, both of which *"will move practices into a situation where co-operation, and collaboration will be fostered"[P5*]. Further, CQL and PQL roles were felt to be consistent with the role of the GP as the *"expert medical generalist in the community" [P3],* leading quality improvement within the practice MDT (*"leading teams in clusters" [P5]*). One stakeholder commented on the potential for clusters, working extrinsically, to contribute to "*local workforce planning*" to "*optimise*" the deployment of these additional multidisciplinary staff according to local need [*P5*]. Equally, the MDT was also seen as important in facilitating cluster work by alleviating clinical workload from GPs to create capacity for cluster engagement: *"The big pressure on GPs now is to provide the clinical capacity to see the patients every day, and you can only take GPs out of the system for so long, out of the working week to do that. The new world envisages more, other cadres, you know advanced nurse practitioners, pharmacists and so on."[P2]* This majority view was not shared by one stakeholder however, who expressed concern that the clusters would represent a *"very GP-focused way forward",* and recognised that this was likely to be detrimental to success of clusters: "*when the clusters were brought together [in Inverclyde] it was very GP focused and very uni professional focused, which meant that others*	Whilst the new GMS contract was explicitly intended to relieve pressure on GPs to facilitate their role as clinical leaders and allow time for engagement in clusters, the overarching opinion amongst the stakeholders was that the reforms had, in fact, had the opposite effect. The cumulative depiction presented across the interviews was that under the new contract, GPs are expected to engage in clusters, train, supervise and lead the new extended MDT, spend increased time with complex patients, and manage their normal clinical workload; the latter of which the reforms had done little to alleviate thus far: *"it's not massively impacted on our workload having other members of the team join, not yet"[SH02]* One stakeholder highlighted how this seemed inherently counterintuitive: *"we put that [cluster] role to GPs when we were trying to actually implement a contract that was taking some of the workload away from GPs… So I think we didn't necessarily think through that one properly."[SH05]* In particular the added workload imposed by requirement for training of the new workforce was highlighted:

	who worked within the multi-disciplinary team – in particular practice nurses and practice managers – felt quite disempowered in the process". *"it's essential that we know this for going forward… that how important it is to get buy-in and ownership from all… members of the multi-disciplinary team …and how that can actually have an effect on whether your [QI] projects are successful or not"[P8]*	*" what can happen is that already stretched GPs are spending more and more of their time supervising and mentoring other members of the team to do the role that they used to do…it's not a sustainable model to have GPs involved in the training of all these other people whilst also doing our own work"[SH02]* In line with the concerns raised by one stakeholder in 2016, the MDT was seen to be largely excluded from clusters. This was felt to be at odds with the general direction of the reforms, which increasingly encourage the view of primary care as a *"team sport"[SH02]* : *"the strategic landscape is changing, because we're working as part of an extended multidisciplinary team and the future of clusters has to recognise that...we'll be starting to explore and understand what that means for clusters going forward"[SH04]* *"we're expanding the multi-disciplinary team to support GPs to be that expert medical generalist…why have we given them the quality role?... it can be any member of that multi-disciplinary team and I think that for me is one of the flaws within our cluster set-up"[SH05]*

MDT involvement in cluster work	Fostering of enthusiasm for clusters was perceived to be crucial not only amongst GPs but also amongst members of the extended MDT. This assertion was particularly prominent in an interview conducted with one stakeholder who had been working with early clusters in Inverclyde specifically to support the involvement of practice nurses in quality improvement (although the benefits of multidisciplinary involvement were also noted by other participants): "*we're thinking about going forward, so, to me, we need to not repeat the mistakes that the past, so to try and capture how important and actually, how able other people within the multi-disciplinary team are , if empowered enough, can go on forward with their own test of change…it's worth capturing the fact that if you don't, whether it's practice nurses, whether it's any member of the multi-disciplinary team, if you don't involve them at the beginning, then you're going to cause anxiety and disruption in the workforce…it slightly frustrates me when we we look at the text books and we've known for many years…if we're wanting to…influence change, how important it is to include everybody and not be uni-professional"[P8].* Within this, there was a suggestion of an inherent, conceptual weakness of the cluster model itself, in its *"uni-professional"[P8*] nature.	Similar to views expressed in 2016, the criticism of the uni-professional nature of clusters was reiterated in 2021. One stakeholder expressed the view that enthusiasm and affinity for quality improvement was of greater importance than professional status in championing of the PQL role: *"quality improvement within that multi-disciplinary team should sit with the person that has a passion for quality improvement and has also the drive and the skills to lead quality improvement activity…it doesn't need to be the GP that's undertaking that post…the practice quality lead could be part of the wider multi-disciplinary team."[SH05]* On the other hand, another stakeholder speaking in 2021 felt that clusters had, in fact, supported empowerment of the wider MDT: *"there's been some devolved or distributed authority to staff and workforce that people that aren't the more senior can really make some great decisions around the operational part of their working"[SH06]*

Supplementary file Table S2.5: Perceived problems with data access in 2016 and 2021

2016	2021
A LIST analyst working with clusters in Inverclyde highlighted that a central shortcoming in the approach to the 'tests of change', with which the clusters were involved, was an undue haste in implementing projects quickly, meaning that pre-project data collection was often overlooked.	There was huge frustration expressed over the "*woefully inadequate*"*[SH04]* availability of primary care data at all levels. At practice level: *"they're not collecting, okay, how many consultations are we doing in a week, what type of consultations are those, what consultations are within our planned care and what are within that urgent on the day?"[SH05].*

He highlighted the importance of using data over "*anecdotal*" evidence in designing these projects: *"some of the outputs from Week of Care [audit] is that it has maybe shown that some of the ideas and things that they wanted to introduce as the test of change aren't maybe what they thought it was. And in the beginning, like the Home Visits [test of change]…they thought too much time was being spent going out to someone on a house call on the other side of Greenock or whatever. But then in the information that we gathered from two Week of Care Audits has shown that the number of house calls isn't maybe as much as it's perceived to be. So that might have had an effect on whether it was introduced way back in the beginning"[P9]* There was concern, however, over the adequate availability of data to facilitate this data-driven approach to quality improvement: *"the feeling I get is that some of the questions that might be asked of the Clusters – the data might not be there…the question they want to answer may not be able to be done by the standard data set that's collected to"[P9]*. There was acknowledgement of the potential usefulness of electronic systems for data extraction such as SPIRE: "*Ensuring that SPIRE works properly will be very important"[P2]* And frustration that such tools were currently unavailable: "*the barriers is just getting data…. I didn't think I would be spending my time data inputting but I did have to spend some of my time doing data input on very basic information that I thought… 2017/2016 we'd be able to pull from some sort of system"[P9]*	At cluster level: "*how do you manage your demand when you don't even know what your demand data is? If you think about that role of clusters…doing that population health needs assessment, how do you do that when you're not…when you've not got, I don't know, six months, a year's worth of data that you're able to look at and look at the different trends and review those trends and look at the different conditions."[SH05]*. At HSCP level: "*70 per cent of all NHS contacts happen in primary care, and if you've not got the data, you know….it would be good to know that health and social care integration has bolstered relationships between primary care and social care, has improved care planning processes to allow people to stay at home more…there are lots of things that it would be really useful to be able to evidence-base, but we can't do that easily"[SH02]* And at national level: "*I can download, you know, an 18 megabit…dataset on ED attendances by board, by time of day, by conditions...into that level of detail. Yet I cannot tell you how many GPs are working in Scotland today and how many consultations we're seeing, and what that demand is looking like. You know, it's unacceptable"[SH04].* Complaints about the lack of national level data in particular extended past clusters and was seen as a fundamental issue challenging primary care transformation more widely: "*we've really suffered from a lack of usable data in our general practice, which has meant that conversations around where the work sits within the NHS, the impacts of shifting or changing the way that work is done in one part of the system, it's difficult to evidence what impact that has on general practice. And it's difficult also to make the case for any resources because they just can't demonstrate what we do."[SH02]* Perception of these major problems with ready access to data persisted despite widespread recognition of the issue:

This was accompanied by concern that the roll out of this system would be hindered by public opposition:

"I'm a bit concerned that SPIRE is now ready to go but is being held up by a lack of political will… I think the reticence really is about politicians being concerned about saying to the great Scottish Public – this is your data and we think it should be used for planning purposes"[P2]

From the LIST perspective, sharing of data on an even wider scale, across different sectors of the health and social care system was seen as important to enabling clusters to address 'big picture' public health outcomes, though the feasibility of achieving this was unclear:

"it's all about the data linkage…I wouldn't know what the availability of being able to do that would be"[P9]

"there are lots of brains on it at the moment, but there's not been any solutions found"[SH02].

One stakeholder suggested a failing of the web-based systems upon which so much expectation had been placed in 2016*:*

"Scottish Government systems that have been invested in and set up to try and extract information, so systems like Spire, have not been successful."[SH04], whist another alluded to the ongoing demand for such tools: *"there are real benefits that could be made in providing systems that would give practices that data that they could then structure their businesses around that"[SH05].*

An explanation for the apparent failing of these systems what not provided, as it was suggested that the anticipated public resistance had not arisen:

"when we sent out to all the citizens this was happening, saving of your information and data…we set up a helpline for those that were going to say, I don't want to be part of this…And we were expecting, you know, to be inundated….with people saying that. And what was the reality [name]? We had zero point zero zero zero two per cent of the population"[SH06].

In the absence of such systems however, extracting data from primary care was perceived as extremely challenging:

"despite primary care being one of our richest sources of data and intelligence, our ability to extract or mine that information, is woefully inadequate"[SH04]

"Trying to negotiate with the profession around provision of data and information, has been drawn out, difficult and frustrating", to the detriment of all aspects of primary care reform: " everything related to that has been…is taking too long, it's been too difficult to do and has been incredibly frustrating for all concerned"[SH04]

Supplementary file Table S2.6: Inherent tensions in the cluster model, as viewed 2016 and 2021

	2016	**2021**
Local autonomy vs national oversight	Whilst the importance of avoiding *"micromanagement from the centre"[P3]* was highlighted as critical to enabling clusters to develop the local autonomy seen to be central to the success of the model, the need to balance this local autonomy with a degree of oversight at national level, was recognised. There was some concern over how this balance could be achieved on a practical level, in terms of how expectations for cluster working could be effectively articulated within the new contract: *"how can we enshrine engagement in clusters in a meaningful way into the contract?' without falling into that trap of making it prescriptive"[P3]* *"what they need is to find a way of ensuring that there are measurable improvements that allow for a degree of autonomy on the part of the clusters….it's a difficult thing to put into a contract because if the IJB doesn't play or if they don't provide the support then its very difficult to hold a cluster responsible for that. If the clusters don't deliver*	In relation to the unwarranted variation observed across clusters, stakeholders identified a lack of national oversight as a key contributor. There were suggestions of the need for better structure, governance, and strategic guidance at a national level to support cluster implementation, and a demand to ensure that measures targeted to aid cluster facilitation was "*consistently applied across boards"[SH02]*: *"I don't think that there is enough thought around how do we make sure that the voice of clusters is being heard within all the groups it needs to be heard in… A CQL in one area may be quite acceptable in that regard, but that may just be because of their personality, because of luck, because of previous roles they've done, and it feels like a lot of it is left to… Not to chance, that probably sounds too critical…* *I: It sounds as though people are just, oh, you get on with it, and a lack of strategic guidance?* *R: Yeah, I think that you're right…I think there is a real need to consider, do a deep dive of how well are clusters performing and what more can be done to support them?…We then spoke with Government and the BMA to say…Can we create some guidance, a framework of what*

	anything and don't meet and don't have any plans, they can say right you haven't fulfilled your contract but if we're in this new collaborative world it means that everyone has to play their part and I think that's the kind of hesitancy contractually"[P2] The difficulty of defining the required level of engagement and achievement within clusters was highlighted: *"measurements are a very tricky issue I think…I think you need to measure. We need to know that its effective and that it's not just lovely rhetoric. But we've to be careful because sometimes the stuff that easy to measure and you have a lot of unintended consequences"* Opinions on how this was likely to be achieved varied between stakeholders: *"[we] can expect indicators around quality elements. Indicators are likely to be developed and shared around"*[P5] *"I think it would be a big mistake… to set lots of local quality improvement targets to replace the national quality improvement targets [of QOF]" [P2]* The recognition that *"more than ever the emphasis is on the local level, Government emphasis is on 'what works for you is important'"[P6]* was juxtaposed with the perceived need for *"universal understanding of what GPs in within their clusters and what clusters will work on… [otherwise]*	*would be the reasonable minimum level of support and resource that every cluster can be expected to have? And they published that guidance about a year and a half ago. And I don't think anything has particularly happened with that in terms of saying, okay, so where are we now, has that been implemented? Have all CQLs got a minimum amount of time? Has everyone got data support? Has everyone got admin support? Is everyone having more opportunities to influence in their extrinsic roles?" [SH02]* Several participants felt that drives to move away from the "micromanagement" of the QOF, had perhaps been carried to excess, to the detriment of progress: *"there was a real recognition…clusters are really important, there's a lot we can offer here, but we need to give them time to establish and begin to grow, without heaping a load of pressure on them…But in hindsight, I wondered if we took too much of a step back, because those that really were engaged and wanted to really flourish, they did nothing."[SH04]* Pursuant to this idea, there was a suggestion of insufficient "drive" from the government, BMA and other 'central' overseeing bodies, with loss of momentum amongst clusters as a result. There were repeated references to the need for external input to *"reboot" [SH04*] or "*reinvigorate"[SH03]* clusters, which participants felt to be dependent upon improved monitoring of clusters on a national level:

	there's even more opportunity for it to be … a little bit dysfunctional"[P8] As such, the need for a degree of overarching strategic leadership from the government was emphasised: *"A lot will depend on the extent to which Government makes it clear that IJBs have to prioritise engagement with General Practices…. [clusters will need] facilitation to make them function as a group, a kind of collaborative leadership-style among the Cluster Quality Leads, some sort of shared leadership development between the clusters and the IJB, which has been set up centrally"[P2]*	*"we need to see where we are, have some analysis, I would think, of the cluster situation in order to reinvigorate it"[SH03].* This monitoring was crucially seen to be lacking by the majority of stakeholders: *" I'm just talking about my cluster, and the clusters that I know about, which are not very many, if you see what I mean…I don't know how it's going on a national level, because I don't know how you'd find that out."[SH01]* *"there is a real need to consider, do a deep dive of how well are clusters performing and what more can be done to support them?"[SH02]* *"we haven't done any analysis, a snapshot of what is happening in clusters for some considerable time"[SH04]* This was seen as necessary to ensure "*that when we come out with recommendations for next steps, is very much in line with our future strategic direction"[SH04].*
Intrinsic role vs extrinsic role	Stakeholders suspected that the intrinsic aspects of cluster work may be given predominant focus, to the detriment of the extrinsic role. Intrinsic working on quality improvement within a cluster was perceived as "*easier*" to adapt to *"because that tends to be more uni-disciplinary"* where as the extrinsic work would require engagement with HSCPs externally, *"and that's traditionally been one of the barriers, General Practice engagement with the wider NHS….its quite a big shift." [P2]*	There was an almost unanimous consensus amongst participants that of the two aspects of cluster working, the intrinsic role was better established: "*I like that internal and external role. And I think having that division is useful conceptually. I think the external role is non-existent"[SH01]*

		This was at least in part attributed to a lack of investment in the latter: *"there's a recognition of the importance of the extrinsic function of clusters, but it's more of a nod to it, than a genuinely integrated way."[SH04]* There was a reiteration of the suggestion put forward in 2016 that the two roles were competing rather than complementary in the context of limited time available for cluster work: *"it's around about building that leadership role particularly in relation to CQL fulfilling those extrinsic functions…I don't think we've supported GPs, so cluster quality leads or practice quality leads to successfully be in that space. I think that's partly because they've not overcome the intrinsic functions"[SH05]* and that the intrinsic role was more easily adopted by GPs: "*that bit [the intrinsic working] feels much more comfortable for clusters"[SH02].* One stakeholder proposed that : *"in some ways, you almost need two CQLs for each cluster, one with an intrinsic role and one with an extrinsic role, so that you don't get lost in the intrinsic stuff which feels more comfortable and easier, and kind of think, yeah, the extrinsic stuff, that will come with time. Because I don't think it*

		will….because it's actually harder if you've not done it before and it's a different set of skills: influencing, negotiating, developing strategies, than it is from sharing learning and running quality improvement projects at a local level"[SH02]