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Research Paper

Swapping Carrots for Sticks: Forensic science provider views of the Forensic Regulator Act 2021

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ABSTRACT

In April 2021, the Forensic Science Regulator Act 2021 received Royal Assent, providing new statutory powers for the Forensic Science Regulator (FSR) of England and Wales. These powers are intended to enable the FSR to compel forensic science providers (FSPs) comply with quality standard requirements. The FSR has until now relied upon 'soft power' and arguments of benefits to be gained if FSPs achieve accreditation and adhere to the Code of Practice. Reaching the limits of persuasive powers, the FSR Act now introduces powers to penalise FSPs who remain unaccredited or fall below published standards. To gauge the potential impact, forensic scientists were asked to anticipate effects of the Act. Practitioners indicated that the new statutory powers could instil a sense of urgency among police force forensic science units in particular, in prioritising quality and investing in accreditation. However, there are significant capacity limitations which may hamper more widespread and sustainable change, such as financial pressures faced by FSPs, as well as resource constraints within the FSR role. Changing from a regulatory approach focussed upon voluntary cooperation, support and encouraging intrinsic motivations (i.e 'carrots'), for one reliant upon deterrence in the forms of threats of sanctions and punishment ('sticks'), could prevent real improvements in quality and undermine the achievement of regulatory aims. The FSR Act is unable to address problems with forensic science provision, that militate against the quality of forensic science services. Thus, benefits accrued from swapping carrots for sticks may be illusory and may ultimately prove counterproductive.

1. Introduction

In the last three decades, the forensic science sector in England and Wales has undergone significant structural changes. Until the early 1990s, most forensic science services, excluding fingerprint analysis and comparison, and crime scene examination (CSE), were provided by the State-owned Forensic Science Service (FSS), through their seven laboratories across the UK. Following increased demands, prompted by the advent of forensic DNA analysis, coupled with problems of increasing turnaround times for service delivery, the FSS was restructured, allowing them to charge for services. This gave the FSS financial independence, [1] but after financial losses, and a series of restructures, and fierce competition from private FSPs that had emerged in the 1990s, the FSS was closed down, making way for a full marketized system of forensic service provision [2,3].

These structural changes took place against a backdrop of long-standing concerns about the quality of forensic science services, including unreliable expert witness evidence and other quality-related issues, concerns heightened by the rapidly changing and expanding marketized forensic science sector [4–6]. In response, efforts to ensure and monitor quality standards in forensic science provision had to evolve. Pre-marketisation, quality standards for forensic service provision were managed via different approaches, inconsistently applied [[3], p. 168], [4]. The FSS had taken a scientific advisory role to the Home Office and police forces, which included establishing standards and setting 'best practice' for some forensic science activities. However, it was considered unwise, for commercial reasons and as a matter of national interest, for the FSS as a private service provider, to continue to offer these advisory functions [2]. A new independent regulator was recommended to "oversee the regulation of the forensic science market and provide independent and impartial advice on forensic science" [[2], p. 28]. Following further recommendations about the remit, responsibilities, and management of such a regulator [7], the role of 'Forensic Science Regulator (FSR)' was established in 2007 as a quality

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assurance regulator, (instead of the initially envisaged market regulator) [6].

The FSR office consists of an appointed Regulator, assisted by a small administrative team, and a Forensic Science Advisory Council and Specialist Groups (for respective forensic disciplines). Working together, they are tasked with ensuring that the provision of forensic science services across the Criminal Justice System (CJS) is subject to an appropriate regime of scientific quality standards. To achieve this aim, a Code of Practice and Conduct (the 'Codes') were produced (and periodically updated), which serve as a single framework of quality standard requirements that apply to Forensic Science Providers (FSPs) (as an organisation), practitioners, and forensic science methods. Individual FSPs are meant to demonstrate compliance with the Regulator's Codes via accreditation by the United Kingdom Accreditation Service (UKAS). While accreditation is the primary mechanism for monitoring FSPs' compliance with quality standards, it is also the means by which FSPs demonstrate their ability to provide products and services that consistently meet the requirements of the wider CJS [[8], p. 2].

Recent data show that: the number of FSPs accredited to the relevant standards in the Regulator's Codes has been increasing; quality-related complaints are being self-reported by FSPs, and investigation of quality failures and recommendations by the Regulators are promoting a 'lessons-learning' culture [9]. Therefore, the FSR role has gone a long way in creating the 'level playing field' for forensic service provision in England and Wales [10]. Despite this progress however, some regulatory goals remain elusive and there are insufficient powers to effectively enable the Regulator to achieve full accreditation of FSPs across a diverse range of forensic science disciplines and activities [6]. This failure is problematic as compliance with the Regulator's Codes and the subsequent effective application of Quality Management Systems (QMS) by FSPs are meant to provide and improve customer satisfaction and confidence in the reliability of forensic science [[11], p. 10].

Effective quality assurance systems are also an important bulwark against miscarriages of justice. Recent high-profile quality failures have also had ramifications, threatening confidence in the quality and reliability of forensic science across the CJS. For the FSR, these cases may have diluted regulatory achievements, and raised questions about the Regulator's quality standards and their monitoring [12,13]. While these failures have been blamed on breakdowns in quality checks and audits which have failed to identify issues in a timely manner, they have also been linked to the lack of powers enabling the Regulator to enforce the accreditation of FSPs [13]. Accordingly, it has long been claimed that without statutory powers, it is difficult, if not impossible, for the FSR to give any assurances that forensic science services are carried out to the required standards [14].

On the 29th of April 2021, a Private Member Bill[1] (The Forensic Science Regulator Bill 2018) that proposed these statutory powers for the FSR role, was finally passed [15]. The Forensic Science Regulator Act 2021 gives the Regulator the authority to publish a Code of Practice (s.2), investigate FSPs (s.5) and issue compliance notices (s.6). The Act thus intends to strengthen the Regulator's Codes, such that, although failure to comply with the FSR Codes will not in itself give rise to any civil or criminal liability, compliance with the Codes will be admissible in evidence in criminal and civil proceedings in England and Wales, where a court may consider such a failure by a person to act in accordance with the Codes (s.4). Also, where a person's undertaking of any forensic science activity to which the Codes apply creates a substantial risk of adversely affecting any investigation or impeding or prejudicing the course of justice in any proceedings, the Regulator can issue a compliance notice, potentially prohibiting the FSP from practicing forensic science (ss. 6(4) and 6(7)). The Regulator can also require FSPs to implement corrective actions to address the issues that merited the compliance notice to be served, after which a certificate of completion will be provided. Failure by a person to act in accordance with the Regulator's Code will be grounds for issuing compliance notices (ss. 6 (5)) [15].

The FSR Act is welcomed by those who have long called for statutory powers for the FSR [[16], p. 29], [[17], p. 11], [[18], p. 13]. The Act has also been passed at a time where the quality and delivery of forensic science in England and Wales has again come under critical scrutiny and been deemed inadequate [[16], p. 3], a conclusion that includes questioning of the effectiveness of both the delivery of forensic services in England and Wales, and the FSR role specifically. It is anticipated that the statutory powers will "bolster trust in the quality of forensic science provision" [[16], p. 3]. However, whether the FSR will be able to deliver on these expectations, will depend upon the ability of the Regulator to utilise these powers, as well as the response of FSPs. The present study intended to forecast the potential impact of the new statutory regulation on the provision and quality of forensic science services in England and Wales.

2. Literature review

2.1. Voluntary vs Mandatory quality standards

Internationally, accreditation of FSPs to the ISO 17025 and 17020 quality standards is the widely accepted method for managing the quality of forensic services. However, there is no global consensus in terms of how compliance with these standards should be enforced. As a result, the enforcement or monitoring of compliance with accreditation within a particular jurisdiction will depend on local or regional arrangements [19]. The approach could be either voluntary, where compliance is achieved with agreement and voluntary cooperation by most FSPs, or mandatory enforcement (used interchangeably here with 'statutory enforcement'), where compliance is required by law, with powers afforded to an oversight body to compel compliance with quality standards or accreditation [20]. While voluntary requirement has been the common approach internationally, mandatory regulation is gaining popularity.

In the US, the 2009 National Academy of Science (NAS) report, "*Strengthening Forensic Science in the United States: A Path Forward*," recommended that "[l]laboratory accreditation and individual certification of forensic science professionals should be mandatory…" and that "[n]o person (public or private) should be allowed to practice in a forensic science discipline or testify as a forensic science professional without certification" [[21], p. 215]. This recommendation was triggered by inconsistencies in the enforcement of 'best practices', operating standards, and certification and accreditation programmes across crime labs in the US. Since then, and following high-profile cases of quality failures at crime labs, some States have established Forensic Science Commissions or bodies with statutory mandates to enforce quality assurance programmes, including investigations of quality failures [22,23], albeit the US National Commission on Forensic Science, established in 2013, was closed under the Trump Administration [24]. Under the EU Framework Decision 2009/905/JHA, all laboratories in EU Member Countries that provide forensic DNA and dactyloscopy analyses are required to be accredited to the ISO 17025 standards [25]. This is to ensure the mutual recognition of the collection, processing, use, and delivery of forensic data between Member States. This law was eventually transposed into England and Wales law, following Brexit, as the "Accreditation of Forensic Service Providers Regulations 2018" [26].

Views have been expressed both in support of and against statutory enforcement of quality standards in forensic science service provision. Many have focused on the cost-benefit implications for FSPs. Others have expressed support for quality standards and accreditation as providing a critical safeguard for reliable forensic science evidence [[27], p. 533] conferring an assurance of quality [15]. Quality standards should promote good practice, and increase transparency and

[1] Private member bills are those introduced by individual MPs or members of the Lords rather than by the Government.

accountability, ensuring that quality-related errors will be reported and acted upon to invoke learning and to assist in the pursuit of continuous improvement [20]. Statutory enforcement offers an advantage over the voluntary approach, through the ability to impose sanctions for practices that may compromise the achievement of quality-related objectives across all FSPs. This may be desired where several FSPs, who may have differing or even conflicting individual interests, co-exist, or compete in a jurisdiction to provide different forensic science services to the CJS.

However, statutory enforcement of accreditation comes at a cost. This includes the financial investment required when developing and implementing legislative instruments, providing adequate resources and support for enforcement agencies, as well as the economic implications for FSPs in meeting compliance requirements [28], [[18], p. 11]. Financial implications for FSPs are significant because while expenses on accreditation and the associated QMS can be substantial, the benefits can be difficult to evidence in concrete (monetary) terms [29]. Therefore, in the absence of a formal evaluation that demonstrates a causal link between accreditation and improvements in quality, and higher quality and better performance in accredited FSPs than in non-accredited FSPs, a convincing case for the statutory enforcement of accreditation will normally fail on the grounds of the increased cost to FSPs for no measurable benefits [29]. A recent study has challenged this narrative, evidencing that FSPs may realise cost savings from implementing quality assurance programmes because the cost of a robust QMS may prove cheaper than the risk and costs associated with the negative outcomes stemming from a miscarriages of justice [30]. While this should motivate investment in QMS, the reality is that funding for implementation, which involves continuous investment in leadership, practitioners, processes, innovation, and the right quality culture, has always been a major obstacle for many FSPs [31]. A study has reported that FSPs who are even able to undergo the process of accreditation have found the cost, visits, time, planning, resources, and financial cost of research, training, and maintaining competent staff even more challenging than they initially anticipated [28]. The cost of implementing quality standard requirements is then a disincentive for accreditation, with some commentators describing this cost as "unnecessary" and an "ever-increasing burden that may detract from quality" [31].

2.2. The need for statutory forensic science regulation in England and Wales

In England and Wales, statutory powers for the FSR role have been repeatedly called for, with links being drawn between a lack of statutory powers and risks to the quality of forensic service provision. While a 'light touch' approach had been initially preferred to avoid putting restraints on the Regulator in the discharge of their duties [3], experts recommended that should this approach fail in achieving the aims of regulation, then statutory powers should be considered [7]. Following the ongoing failure to secure the accreditation of FSPs, the Government thus consulted on the provision of statutory powers for the FSR role [32]. Specifically, powers to address the risks that may arise where FSPs fail to comply with investigations instigated by the Regulator following a serious quality breach and complying with suggested improvements; and where pressure to reduce costs may cause accreditation requirements forming part of forensic service procurement agreements between police forces and private FSPs to be removed [32]. The overarching aim of statutory powers, was portrayed as providing an equal and fair environment in which all FSPs operate, both public and privately run, to ensure that the CJS continues to receive high-quality services [32].

Government consultations considered the cost of statutory regulation, mainly, the imposition of bureaucratic burdens on both the FSR role and FSPs [32]. Proposals stressed the need to avoid increasing this burden because of the cooperation and compliance with regulatory requirements by most FSPs under the voluntary regime. However, compliance has not been consistent and some forensic science activities have experienced accreditation delays and left gaps in quality standard requirements. These include Image Comparison, Digital Forensics, Incident Scene Investigation (for volume and serious crimes), Forensic Collision Investigation, and Sexual Assault Examination [9]. Stakeholders believe that the lack of statutory powers could convey the "wrong message" about the seriousness of accreditation requirements and the urgency for police forces to be accredited by the Regulator's deadlines [[16], p. 27]. This may be partially explained by reports that some private-owned small and micro-business FSPs and police forensic science units have continued to operate even while eschewing accreditation [[12], p. 3], [[18], p. 2]. Notwithstanding, the Regulator, police forces, and private FSPs have alluded to the enormous impact that the "significant under-investment" in the provision of forensic science services, and inadequate resourcing and support, has had on the accreditation of FSPs [[33], p. 3]. The financial cost associated with complying with and being assessed against the FSR Codes has been described as the "single biggest challenge" to achieving the aim of the FSR" [[34], p. 6].

Debates then about the cost-benefits of accreditation and statutory enforcement mean that the implementation of the new statutory regulatory powers for the FSR role perhaps then cannot be simply viewed in positive terms. There is the potential for adverse reactions to the FSR Act, which could hamper the achievement of the goals of the FSR Act. This study thus forecasts potential outcomes of the FSR Act by understanding the extent to which individual FSPs welcome statutory regulatory requirements, and the degree to which they are/will be motivated to comply.

3. Methodology

3.1. Recruitment of participants and data collection

Target participants for this study were individual FSPs,[2] given that they must comply with the regulatory requirements and hence their activities will be impacted by the FSR Act. After receiving ethical approval from Northumbria University (Ethics reference number: 4503), individual FSPs were recruited using the purposeful sampling approach via email addresses obtained from the UKAS publicly available directory of accredited FSPs. Other participants were also contacted using information from parliamentary enquiries on forensic science. Eighteen participants with a range of experience between 12 and 35 years in forensic science practice in the UK with varying backgrounds and interests in the sector consented to be interviewed (Table 1). These comprised independent practitioners (academics[3] and consultants; n = 7) and eleven representatives from FSPs (forensic science directors and quality assurance managers from police forensic units; n = 4 and private FSPs; n = 7). Data were collected via semi-structured interviews, with the main research question: what do you anticipate will be the impact of the FSR Bill?[4] Further probing questions were asked based on the participants' responses. All the interviews, which took place between October 2018 and March 2019, were conducted over the telephone and tape-recorded, lasting between 25 and 60 min.

[2] A broader definition was adapted from the definition of the FSR Codes of Practice and Conduct. This comprises individual forensic practitioners, academics, public or private sector forensic science providers, small teams in larger organisations, sole practitioners or large providers, working for the police, or instructed by the prosecution or defence. See FSR Codes—*Issue 4*, p.13.

[3] Many of which had previously been practitioners within corporate FSPs.

[4] The FSR Act was at the Bill stage during the time of the study and data collection. This has not changed the data and interpretation of this study as the Bill did not undergo any change in the statutory provisions during its stages in legislation process.

Table 1
Description of participants from across different classification of FSPs.

Classification	Participant (role)	Description
Police forces	R09 (Director of forensic science)	Accredited
	R11 (Quality Assurance Manager)	Accredited, but with gaps, such as crime scene examinations
	R14 (Director of forensic science)	Accredited for all forensic science activities
	R17 (Director of regional police forensic science consortium)	Accredited for all forensic science activities
Private providers		
Large-scale	R13 (Quality Assurance Manager)	Accredited
	R02 (Director of forensic science)	Accredited
Small-scale/sole trading	R04 (Director/expert witness)	Not accredited
	R06 (Director of forensic science)	Not accredited
	R07 (Director of laboratory/ expert witness)	Not accredited
	R15 (Director of laboratory)	Accredited
	R16 (Director of laboratory/ expert witness)	Accredited
Independent practitioners	R01	Former quality assurance manager (private large-scale FSP).
	R03	Academic forensic practitioner and a former director (FSS laboratory).
	R05	Academic forensic practitioner and a Consultant.
	R08	Former director (private sector FSP).
	R10	Academic forensic practitioners and a consultant in policing.
	R12	Solicitor (Special interest in FSR role).
	R18	Forensic Science Practitioner and a consultant in policing.

3.2. Data analysis

Data analysis began with the transcription of the interviews, and subsequent management and coding using NVivo software. Each transcript was labelled with a code name "R" followed by the recording number, for data and participants' anonymity and confidentiality. The interview data were analysed simultaneously as the data collection process to keep track of key emerging themes. This also helped to guide future interviews. Thematic analyses identified key commonalities and differences in the participants' responses to form codes [35]. Through repeated readings of transcripts, both positive and negative impacts of statutory powers emerged. To ensure the validity of the data and veracity of their interpretation, the member-checking procedure was used [36]. Thus, interview transcripts were sent back to participants for confirmation of their responses and to suggest any amendments and allow for any corrections.

A descriptive account of the interview data is detailed in the next section. A generic approach to summarising the key responses from the participants has been adopted by using the phrases 'most participants' and 'some participants'. The former is used when the number of participants is more than half of the total number of participants while the latter is used if the number is less than half. Where appropriate, multiple extracts from different participants have been quoted to illustrate the range of participants' views. However, in quoting the extracts, the emphasis was to select extracts that are rich in illustrating the focal points of a range of experiences from different participants. As a result, some themes contain multiple extracts from a single participant, albeit this selective approach was controlled to not rely too heavily upon a small number of participants.

4. Results

4.1. Context for results and limitation

The study target (FSPs) are defined as "individual forensic practitioners, academics, public or private sector forensic science providers, small teams in larger organisations, sole practitioners, or large providers, working for the police, or instructed by the prosecution or defence" [[37], p. 13]. In addition to these different classifications, the landscape of service provision by FSPs is highly varied and not easily discernible. Some police forces (of the 43 across England and Wales) and some public agencies provide forensic services in-house in forensic units (these are not universal within forces however with some forces collaborating regionally). The forensic techniques lying outside the capabilities or capacity of the public sector are outsourced to private FSPs via individual or regional police procurement arrangements [38]. Accreditation is a requirement for private FSPs to bid for outsourced services and UKAS website contains a list of accredited FSPs. However, it is difficult to account for all FSPs in England and Wales as some services (such as aspects of digital forensics) are purchased outside procurement arrangements on an ad-hoc basis, and some un-accredited FSPs may provide these services. (There is therefore no way of reliably estimating the number of FSPs in the sector, further complicating regulatory efforts).

Further to difficulties in identifying participants, was obtaining study participants from police forces and private small-scale FSPs. For instance, a private small-scale FSP declined participation because "…*due to our position in the forensic market, our relationship with the Forensic Science Regulator must be carefully managed, so it would not be appropriate for me to discuss the FSR role, its impact and the FSR Act.*" Recognising this difficulty, which affects determining the adequacy of a sample size appropriate for generalising the data, (a limitation of most qualitative studies), an alternative approach was to purposefully explore views from representatives from each of the different classifications of FSPs, including accredited and unaccredited FSPs, to understand commonalities and obtain a diversity of insights about the FSR Act (See Table 1 above). This was better than sampling from just one group of FSPs, such as only private FSPs. The study findings are, therefore, limited to the views of a convenient sample of FSPs who were willing to discuss the role of the FSR and the FSR Act, and there are several FSPs who may have views that are not captured. However, representing the views of participants (forensic science directors and quality managers from different groups of FSPs) who have rich experiences from many years working in the forensic science sector and regulation, the results can be considered an acceptable snapshot for understanding different appreciations of the FSR Act.

4.2. Potential positive impact of statutory powers

4.2.1. Statutory powers will give "more teeth" to the Regulator.

Most participants agreed that voluntary accreditation requirements have led to gaps in compliance, with some claiming that the Regulator's requirements in their current state "*are just there as words and lack meaning.*" The strongest positive impact expected was then the sense of urgency and importance that statutory powers should provide in achieving full accreditation and compliance. A participant thought that statutory powers will give the Regulator *"more teeth to sanction organisations that were recalcitrant; they were slow in complying and behind deadlines, and persistently failed to fulfil the requirements"* **[R05]**.

Most participants, including all the police representatives, pinpointed problems of non-compliance and gaps in accreditation as particularly prevalent in police forces. There was an emphasis then that enforcement powers will have a "*significant impact*" on police forces. Police participants conceded to missing some deadlines for accreditation for different forensic science activities but identified the root cause as of lack of understanding of accreditation and support by senior police officers. As a result, in the extract below, a police participant was emphatic that statutory enforcement powers can change the mindset of police chiefs to see accreditation as "*something essential*" rather than as "*something nice to have*":

> "You don't have the same level of accreditation in anything else in Policing…Most of the senior police have seen [accreditation] as overly bureaucratic and something that is quite unnecessary…So, there is something about accreditation [in police forces] that, unless it is bound in legislation, people may choose to follow or not." **[R14]**.

Most police participants referenced the increased number of accredited fingerprint bureaux brought about by separate EU regulation and were inspired that similar statutory enforcement powers for the Regulator will drive a "*huge appetite"* for accreditation across the areas where gaps exist and to quicken the process **[R17]**.

4.2.2. Investigation and sanctioning powers will be "game-changing"

Most participants thought that investigative and sanctioning powers will put the Regulator's role in a "*powerful position"* to be recognised as in charge of quality; and make a "*significant impact*" on public confidence in forensic science. This view emerges from disappointment in the lack of authority of the Regulator to suspend FSPs involved in recent high-profile quality failures. The independent practitioner quoted below, expressed the impact that the Regulator will have with sanctioning powers:

> "…unless [the Regulators] can wield the big stick; it is not only having the courage, but [they] have to be able to wield the stick, and the stick is only effective if the industry knows that you are capable of wielding and will wield it!" **[R08]**.

Some participants believed that sanctioning for lack of accreditation and quality failures will force FSPs to review and improve their forensic science practices and invest in quality to ensure that there is consistency and quality assurance across the sector. A police participant shared this aspiration as below:

> "Of course, with statutory powers, if it enables the Regulator to come and investigate or particularly suspend a particular forensic unit, that will certainly make people sit up and think about whether they put enough money into that, whether they resource it appropriately, whether they are supporting that." **[R14]**.

Some participants were supportive of powers to issue corrective actions or demand remedial action from FSPs for quality failures because these would help the Regulator to "*fully"* disseminate and enforce recommendations for learning lessons and continuous improvement across the forensic science landscape. Sharing similar hopes, a representative from a private large-scale FSP described the statutory regulation as "*a game-changer in many senses of the word because it [will] change and evolve the forensic environment to a different level."* **[R13]**.

4.3. Potential negative impact of statutory powers

4.3.1. An "iron fist" could have detrimental effects on forensic service provision

Most participants tempered their support for statutory powers with impressions that prohibiting FSPs from providing services because they are not accredited or did not meet deadlines was overly legalistic. Highlighting the existing lack of funding and support for police forces and small-scale FSPs, and a costly UKAS accreditation process, it was emphasised that prohibition powers threaten the collapse of private FSPs, especially those operating on a small-scale. Putting the cost of gaining and maintaining accreditation in context, a participant from a small-scale FSP was worried that compliance notices and probation of service will "*put a heck of a weight*" on FSPs, and this will be detrimental for small-scale and sole-traded FSPs. **[R07]**.

Police participants shared concerns that budgeting priorities of police chiefs and the allocation of funding for policing activities, has meant money has been moved from forensic science budgets, with senior police not particularly alive to, or understanding of the need for accreditation. A view was expressed that *"if police forces are forced to put all their money into accreditation by the statutory powers, then there is even less money to run the forensics, and so you can argue where a miscarriage of justice can happen."* **[R01]**.

Some participants underscored the rationale for prohibition powers as the ability to remove unqualified FSPs from the forensic marketplace. However, concerns were expressed that this has been "*pushed the other way*," with the risk of losing competent practitioners and small-scale FSPs who cannot afford the UKAS' expensive accreditation. A view was expressed that losing "*any*" FSP from the marketplace for financial difficulties but not because they are incompetent "*is not the right way*" **[R01]**. A particular concern was that forcing the closure of small-scale providers and losing the expertise of sole-traded practitioners will introduce a monopoly in the forensic marketplace, where only "*the big names*" will be able to survive. This was seen as primarily detrimental to the provision of forensic science services for the defence which is most often provided by small-scale and sole-trader practitioners. A sole-trading practitioner explained:

> "I have taken a decision not to offer certain services because those are the ones that the Regulator would require me to be accredited for, and I cannot afford the accreditation. So, I have stopped providing those services and do offer other services that are outside the scope of the accreditation" **[R04]**.

Police participants indicated that should some police forces be prohibited from providing some forensic science services because they could not achieve accreditation on time, then that will be the "*downside of statutory powers because police forces will not be able to provide the evidence they need to*." **[R11]**. There was argument that there is already a lack of capacity for some forensic services, such as toxicology, hence prohibition powers could worsen issues, a participant believing that: *"the aspiration of statutory powers is right, but the execution is wrong"* **[R09]**.

4.3.2. FSPs may lose intrinsic motivation for improvement and innovation

Participants worried that prohibition powers for non-accreditation could risk the 'intrinsic' motivation that FSPs should have towards QMS and accreditation. Pointing to the statutory accreditation of fingerprint bureaux as an example, a view was expressed that although sanctioning powers could increase the accreditation rate for some forensic science areas, accreditation could be sought not for its own benefits, but merely to avoid the legal consequences of the FSR new regulatory powers. A police participant admitted that if the deadlines for accreditation are legally mandated then it will become a case of: *"we will get it, isn't it? If you are forced to get something you will do it, won't you?"* **[R11]**. However, other police participants explained that being *forced* to get accreditation may be deleterious to good practice in forensic science laboratories. An example was given that the motivation for accreditation of police fingerprint bureaux was not based upon improvement and assuring quality, but on avoiding the potential for fingerprint evidence to be challenged in court. The participant concluded that:

> "I think [statutory powers] would make a huge difference but I counter that because it comes back to why [police forces] should do

quality; if you understand why you are doing it and the benefits, you shouldn't need someone with powers to tell you to do it…Police forces are getting accreditation [for fingerprint bureaux] to fulfil separate legislation; they are forgetting why they should want to do quality and deliver it." **[R17]**.

Some participants also anticipated that statutory enforcement powers could impose strict conformance with regulatory requirements which would then stifle flexibility and innovation. Explaining the need to undertake research and development to refine methods and procedures and develop new techniques, some participants felt that it will be "*difficult for FSPs to innovate new and better methods for forensic testing and analysis because that will come with a huge cost for accreditation or a threat of compliance notices and prohibition powers"* **[R09]**.

4.3.3. The Regulator could overstep boundaries with their prohibition powers

Some participants believed that the power to prohibit FSPs from operating, places the Regulator in a position to decide upon the admissibility of forensic science evidence in court. Yet this decision should remain the sole prerogative of the courts, and that judges "*will [n] ever want to allow anyone else to decide, including who appears in court and who doesn't*" **[R16]**. Participants referred to a "*fine line*" between the remit of the Regulator in setting quality standards and deciding who can operate as a forensic provider, and ruling what evidence will be admitted as evidence at court. A participant expressed concern that prohibition powers could see the Regulator overstepping boundaries as a quality assurance regulator:

"…The Regulator feels that at some point if [they] have statutory powers, they can effectively suspend organisations from completing their work if they are not accredited. But even if they are not accredited, I do not think it is for the Regulator to decide that a piece of evidence is admissible, thus, to the court" **[R14]**.

Some participants also shared worries about the lack of clarity, in terms of how the Regulator can apply discretion when issuing compliance notices and prohibition notices. Participants expressed concern that a one-size-fits-all approach to sanctioning FSPs may lead to unfairness and would be incommensurate with the ultimate purpose of quality regulation in forensic science. A "*blanket*" approach where any error would automatically lead to the prohibition of an individual's practice was opposed.

"…you must accept that there will be errors and that is why FSPs have the systems in place, not only to try and mitigate against errors but to deal with errors when they happen. So, it is the significance of the impact of that error that, for me, [should] determine whether you are suspended from undertaking your work." **[R14]**.

4.3.4. The FSR Act will struggle to have a meaningful impact

Most participants highlighted gaps in the proposed statutory powers. Firstly, participants referred to the limited staffing of the FSR office and thought that even with investigative powers, the Regulator cannot inspect police forces and private FSPs in "*any meaningful way*" to reliably identify problematic areas. Secondly, views were expressed that the new powers are incompatible with the "*core spectrum*" of the problems faced across forensic service provision. In particular, that this new regulatory regime does not constitute a comprehensive approach to forensic science regulation because it is "*too pragmatic and practical*" and fails to address fundamental issues, such as what should, and what should not even be classified as forensic science. Some participants were "*disappointed*" with the definition of forensic science activity in the FSR Act ('activity relating to the application of scientific methods for the purposes of detection or investigation of crime, the preparation, analysis, or presentation of evidence in criminal proceedings'). While some participants thought it is too broad to be effectively covered by the FSR, others felt that an appropriate definition, informing the scope of the FSR and influencing operational decision-making. Thirdly, already existing gaps in regulatory oversight between laboratory-based forensic science and other non-laboratory practices (such as crime scene investigation or digital forensics) was highlighted, with concerns that the central focus of the statutory powers on accreditation and lab-based issues will further widen this gap. A small-scale specialist provider and previous member of one of the Regulator's advisory groups, thought that this gap is unaddressed by the Act, and represents a "*great mistake at the moment*" **[R06]**.

Further, some participants thought that the statutory powers contained in the Act are not necessarily compatible with ensuring meaningful improvements in the quality of forensic science. In its current form, some participants thought that regulatory powers could actually give a false sense of hope for "*changes*" in forensic science, but that the actual drivers for change are unaddressed. Insufficient funding for the FSR role and potential confusion over their remit and the use of their powers, coupled with inadequate funding for police forces to commission adequate forensic services were highlighted as potential barriers to impact. A participant explains:

"I don't see anything changing, substantially, for the better, until the system beneath the Regulator is addressed… I'd rather no statutory powers be given at this point than statutory powers that don't have a proper effect. And if we accept a poorly drafted Act, that we accept that the Regulator is given a proper standing within government but when it comes down to practicalities nothing really changes, then we are kind of party to the failure!" **[R08]**.

5. Discussion

This study explored the views of practitioners of the potential impact of the Forensic Science Regulator Act on the provision and quality of forensic science services in England and Wales. Overall, although well intentioned motives prompted the Act, there are mixed views with both positive and negative outcomes anticipated. However, these opinions were not divided along discernible lines among participants, such as the sector they are from (i.e., public, or private FSP). Views were distributed across the range of participants, such that individuals who perceived some positive impacts of the FSR Act counterbalanced their responses with expectations of some negative outcomes.

On one hand, there is a strong belief that both investigative powers and the imposition of compliance and prohibition notices for non-accreditation will put pressure on all FSPs to prioritise and invest in accreditation and other quality assurance measures. It should be expected that these powers may also allow the regulator to finally address non-compliance among police force forensic science units which has become a persistent problem. On the other hand, in addition to expecting an increased financial burden on already financially and resource constrained FSPs, the statutory powers can only tackle the symptoms of a problem (non-compliance with quality standards) while ignoring, or even exacerbating the root cause (the underfunding of, and lack of investment in forensic science). Thus, participants are sceptical that the statutory regime can do anything to address the real issues that militate against high quality forensic science. It may be that the Act prompts yet more shrinking of the forensic science sector, with smaller, or more financially precarious providers leaving the sector, or going bankrupt, if now forced to gain accreditation. While in some instances, if the FSP was indeed providing 'poor' quality services, this may be beneficial and protect against the risks of low quality forensic testing and evidence, however, this impact is unlikely to be limited to just those providers, but may also see the closure of high quality providers who simply cannot sustain their business. Indeed, all participants who thought that compliance notices and prohibition powers could rid the forensic sector of unscrupulous forensic practices were also worried about a ripple effect that the collapse of FSPs could have on the wider CJS.

While not prioritising the sustainability of FSPs over the need for forensic service provision and outcomes underpinned by robust QMS, critically, if the FSR Act puts the sustainability of FSPs at risk, then it may in fact undermine the provision of quality forensic science services. Contraction of the forensic sector already experienced, could be worsened by prohibition powers, leading to more and wider 'gaps' in forensic provision in England and Wales. Shortfalls in some forensic science areas, including toxicology and digital forensics have been reported [9, p. 2], along with the collapse of some private FSPs [39], eventualities that could increase if the Regulator uses their powers. Such fears should not be dismissed. In the US, the potential closure of crime labs and the consequent effect on forensic capacity in the CJS had been a major reason crime lab managers could not support federal reforms that had proposed mandatory accreditation for crime labs [40]. The concerns expressed in this study about economic hardships facing FSPs suggest that any sanctions demanding financial commitments from FSPs, including compliance with corrective actions and recommendations, will be difficult to enforce without risking the viability of the FSP. Thus, without adequate funding to allow police forces to both deliver and purchase forensic services, as well as invest in quality and accreditation, there is the likelihood of losing competent but financially precarious FSPs.

Participants also anticipated a trade-off between legal sanctions and the intrinsic motivation required of FSPs to ensure the pursuit of quality assurance and improvement. In particular, the anticipated positive impact of the FSR Act was largely based on a perception that police forces have been ill-intentioned and unsupportive of accreditation. This has also been expressed in stakeholder reports [[41], pp. 25–28]. However, this study found that police forces express both support for accreditation and the FSR role, but that competing demands on police funding meant that police forces are easily frustrated in their attempts to seek accreditation. Police participants were dismayed by the continual reporting of failures to achieve quality standards among police forces, that apparently drove calls for mandatory accreditation [42].

The anticipated move away from intrinsic motivation for accreditation was evident in suggestions that should statutory accreditation be implemented, some FSPs may only support it in principle, or even if they do comply, the reason will be to avoid legal consequences, rather than seek improvements or the best quality forensic science provision. It could therefore motivate FSPs to merely reach 'minimum' standards, rather than striving for best practices.

This outcome, known as symbolic and creative compliance, is known for creating a false sense of regulatory effectiveness [43]. This was equally criticised by some police force participants who thought that being forced to gain accreditation detracts from the actual importance and rationale for accreditation. Indeed, although accreditation offers several advantages, an assumption that there is a causal relationship between accreditation and quality assurance and/or improvement can often be misguided [44]. However, it has been found that organisations that pursue accreditation when internally motivated do experience a significant quality improvement (in the form of an improved production process, fewer customer complaints, and more motivated personnel) than those who pursue accreditation because of external pressure, such as satisfying regulatory demands [45]. Thus, pressure intensification and legal imperatives to increase the number of accredited FSPs could have the unintended consequence of substituting intrinsic motivations for accreditation, which can be more powerful in achieving real quality improvements. This outcome will thus militate against the aims of the FSR role, with FSPs seeking accreditation to merely satisfy basic legal requirements and limiting changes to just those that can ensure adherence to accreditation. A fixation merely on meeting the (static and conservative) standards can also breed complacency about quality and improvement in general and inhibit innovation and discovery.

This anticipated outcome was inextricably linked to a third theme where prohibition powers were questioned for expecting behavioural changes with just deterrence and the threat of sanctions. Research has shown that such an approach could have limited success in avoiding major risks and adverse practices, especially those that are caused by unethical and rogue behaviour [46]. Also, FSPs could oppose such an approach as they will perceive external threats as inconsistent with their values and needs [47]. The success of wielding sticks as opposed to providing carrots, relies on their skilful handling, such as explaining the importance of sanctions in detail and in keeping the use of sticks in strict line with the goals of regulation [48]. Most participants in this present study criticised any blanket approach when suspending FSPs for any case of quality failure. Specifically, from a criminal justice perspective, it was thought that the prohibition of FSPs for non-accreditation, for instance, will be inconsistent with the Criminal Procedure Rules (CPR) concerning the admission of expert witness evidence in England and Wales. This is because under Parts 19.3(3)(c) and 19.4 (a) of the CPR (as amended) [49], and Part 19 of the Criminal Practice Directions [50], measures are already available for the courts to deal with forensic evidence that is not supported by accreditation, including any disciplinary proceedings, or other criticisms about forensic expert witnesses, such as by the FSR. These provisions do not necessarily forbid the admission of expert evidence if accreditation has not been achieved. As a result, the use of statutory prohibition powers by the FSR for non-accreditation of FSPs will be a step ahead of the law. This has been the view of the judiciary when responding to whether the FSR should have statutory powers: that to ensure an effective statutory basis, it will be necessary to give the court general powers to refuse to admit evidence obtained in breach of the Regulator's Code, where it would be contrary to the interests of justice to admit it, else an automatic exclusion of expert evidence for a breach of the FSR Code is "too inflexible" [51].

Moreover, even the prohibition of FSPs for high-risk or persistent quality failures was seen by some participants as unjustifiable, an approach where compliance notices and investigative powers to demand corrective actions from FSPs was seen to be more supportive and the preferable alternative (wielding carrots, not sticks). This would be in line with the recent approach taken by the FSR role in promoting a 'lesson-learning' culture from quality failures, which has been central to the success in increasing the reporting of quality failures by individual FSPs [9]. Yet, this study does not provide an indication of whether reporting of cases or the adherence to post-investigation recommendations will continue to improve under statutory regulation. This is because the performance of the successive Regulators in respect of the investigation of quality failures has been driven by, and dependent upon the voluntary cooperation of FSPs in reporting cases of quality failures. This will continue even with the provision of whistle-blower provision for the FSR role and investigative powers. In this context, criminalising forensic practitioners and suspending FSPs involved in "scandals" from the marketplace [16, p. 16] could threaten the continuity of FSPs and sully the reputation of the whole of forensic science, damaging public confidence. With such high stakes, this could adversely affect the (timely) reporting of quality failures, and the ability of the Regulator to collect and collate information about risk-causing activities across FSPs. Notwithstanding, the recently appointed Regulator may have calmed such fears when promising to continue to work collaboratively with FSPs and to use prohibition powers rarely [52]. This approach should help build ethical and professional values among individual FSPs to create a quality culture and ensure that the public retains confidence in forensic science and expert witnesses [46,53].

The final theme was whether the FSR Act is the best solution to the numerous quality-related challenges currently facing forensic science in England and Wales. The main issue that triggered the FSR Act (non-compliance with accreditation) was juxtaposed with what was considered "real" or "bigger" threats to the quality of forensic science. These were financial difficulties in the forensic science sector and the associated implications for the criminal justice system more widely. Participants thought that although the statutory powers are targeted at non-compliance with accreditation, this can be attributed to inadequate funding rather than accreditation being voluntary. Cuts to funding have

meant that police forces are unable to properly commission sufficient forensic services, and that they are often taking poorly informed decisions based upon fiscal considerations rather than scientific need. Recent studies have highlighted issues such as the commissioning and delivery of forensic science services by police forces being dictated by cheaper prices and quick turnaround time instead of quality imperatives [[9], p. 11], [54], [[55], p. 74], [56,57], [[58], p. 172]. Additionally, long-term aims of the FSR Act cannot be achieved because of the inadequate financial resources and workforce capacity supporting the FSR role. These concerns are unsurprising as it has long been established that the FSR role cannot work in isolation to achieve the numerous quality-related objectives or address the numerous factors which contribute to the quality of forensic services.

Regulators continue to be limited in terms of the changes they can make to annul the significant adverse impact of these external inhibitors beyond their control [10]. For example, it has been a long-term priority of the FSR role to ensure that FSPs who have not adopted the relevant quality standards are not routinely instructed by legal professionals or contracted by police. However, this has been difficult to achieve, and instances have been reported in the courtroom, where experts who have been repeatedly, and seriously, criticised by the courts, and those who have failed to meet the required quality standards are instructed to provide evidence in a substantial number of cases [[9], p. 27]. Providing the FSR with statutory powers without addressing the external factors which equally undermine the quality of forensic science services could be creating a nominal regulatory reform that creates a false sense of security in the quality of forensic science [22]. This could simultaneously create or exacerbate tensions elsewhere in the complex interdependent forensic science and criminal justice system [59]. This has recently manifested in the passage of the Accreditation of Forensic Service Providers Regulations 2018 [26], where even though the number of accredited police fingerprints bureaux has increased because of fear of legal complications, significant adverse economic implications and inefficiencies have been reported simultaneously across policing because of the rush for accreditation [9]. Therefore, the provision of adequate funding for forensic science provision cannot be more urgent, easing pressure from the FSR role and helping the Regulator to use available resources effectively to address pressing quality-related issues, such as properly defining forensic science to address gaps in regulating several non-laboratory-based forensic science activities (see [10] for further detail).

6. Conclusion

This study explored some potential impacts of the FSR Act in England and Wales on the provision and quality of forensic science services. On one hand, some short-term positive impact is expected with investigative powers, compliance notices, and potential prohibition powers putting pressure on non-compliant FSPs, especially police forensic science units, to gain accreditation. However, using statutory regulation to effect long-term changes or significantly impact on quality assurance and improvement, may prove ineffective. Any benefits accrued from the new statutory powers may prove illusory and temporary. This is because the FSR Act addresses non-compliance with accreditation, but not the inadequate funding of forensic science in England and Wales which is far more detrimental to the provision of adequate forensic services and investment in quality. Furthermore, reforming the FSR role to effect behavioural change among FSPs in terms of how they approach quality, to an approach reliant upon sticks instead of carrots, may force symbolic or 'creative compliance', and risk the viability of FSPs. Focus upon compliance with minimum standards may stymie improvements and the development of forensic science as a discipline and intrinsic motivations and cultural attitudes to quality may atrophy.

The anticipated outcomes outlined do not completely discount the ability of the FSR Act to have a long-term positive impact. However, this can only be achieved if broader issues, including inadequate funding and resources for FSPs and the FSR role are simultaneously addressed. The FSR and the sector in England and Wales simultaneously need to also take account of and incorporate challenges and changes in the discipline more widely, and internationally. The recent 'Sydney Declaration' [60], an effort by some leading forensic scientists to 'revisit the essence' of forensic science, warns a focus upon trees risks losing sight of the forest, with accreditation potentially acting as a 'cover' for wider issues, a misguided and a short-lived solution to problems [[60], p.4]. The FSR will also need to ensure that in using their powers, there is not a faulty focus upon 'tools' and process (trees) rather than purpose and context (the forest).

At stake, is how to nurture intrinsic motivation and a quality culture at the same time as taking effective action against those who fail to adhere to standards and prevent poor quality forensic provision. The effectiveness of quality assurance regulation heavily depends on the quality culture of service providers and wielding a big stick may have too many adverse impacts and threaten the viability of small-scale and sole-traded FSPs. The FSR will need to be able to discern between those situations where a disciplinary (stick) approach will be beneficial, rather than appreciating that quality issues may simply be improved by greater resourcing (more carrots in the sector). How these decisions are taken, is critical, particularly as the Regulator is still not empowered to intervene in the marketplace directly. The FSR cannot 'fund' FSPs, only the contracting parties can decide whose services to purchase. The FSR further constricting the sector by threatening or closing providers may have a domino effect in making the sector even more precarious and force contractors to revert to in-house services, contract with non-compliant providers, or even simply stop undertaking forensic testing. In building upon the quality culture where FSPs intrinsically seek accreditation, carrots will thus remain essential. Merely swapping carrots for sticks may just change the nature of the problems faced by forensic science in England and Wales. As this study has shown, that there are different views about how the FSR Act may impact on the sector. The FSR will have difficult decisions to make and will need to ensure wide engagement with the community to address misunderstandings, misconceptions, and uncertainties concerning the FSR Act.

CRediT authorship contribution statement

Emmanuel Nsiah Amoako: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing. **Carole McCartney:** Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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