

ADVANCED REVIEW OPEN ACCESS

# The Quest for Regulating Crime Scene Investigation in Forensic Science: Can We Learn About Discretion and Standardization From Other Fields?

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**Received:** 30 January 2025 | **Revised:** 14 March 2025 | **Accepted:** 31 March 2025

**Editor:** Olivier Delémont

**Funding:** This work was supported by the Fonds de Recherche du Québec-Société et Culture, Postdoctoral Fellowship.

**Keywords:** crime scene investigation | discretion | quality assurance | resistance | standardization

## ABSTRACT

Growing calls for better standards and quality assurance, particularly in crime scene investigations, have raised questions about the impact and suitability of these regulatory mechanisms on the forensic process. However, to date, debates on whether quality management strategies are “fit-for-purpose” have often overlooked how standards may influence the existing power dynamics inherent in forensic science and policing. Research in other sectors, such as public administration and policing, has nevertheless shown that frontline practitioners demonstrate a significant ability to resist standardization efforts. Police officers, teachers and physicians maintain considerable discretion in navigating and (re)interpreting standards to deal with the unique contingencies they face in the field and to respond to any perceived threat to their professional autonomy, competence, and identity. As crime scene examiners share many similarities with these other professional groups, this advanced review suggests that assessing the suitability of quality management strategies for standardizing crime scene investigation should better account for crime scene examiners’ ability to negotiate, adapt, or even resist these strategies based on pre-existing sociocultural practices. This calls for further empirical research into the actual effects—both positive and negative—that these standards have on perceptions, practices, and outcomes in forensic science.

## 1 | Introduction

From the early discussions on quality management in forensic science in the mid-1980s (Pereira 1985; see also Amoako and McCartney 2021; Ross and Neuteboom 2020) to the recent Final Report of the Commission of Inquiry into Forensic DNA Testing in Queensland (Sofronoff 2022) in 2022, numerous inquiry reports from around the world have repeatedly emphasized the need for improved quality assurance and standardization (e.g., NAS 2009; Pollanen et al. 2012; President’s Council of Advisors on Science and Technology 2016; Science and Technology

Select Committee 2019). According to Neuteboom et al. (2023), forensic science providers cannot nowadays afford to operate without it, so long as the system employed is fit for purpose. After all, if many other professional fields, such as aviation, health care, and the pharmaceutical industry, are accredited by quality standards (Gestring 2023), they should be a reasonable way to regulate forensic science too (Cole 2017). In recent years, the call for more standards and quality assurance has been extended to crime scene investigation considering its critical impact on the quality of the whole forensic process: any mistake made on the scene, whether it implies wrong manipulation,

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inadequate prioritization, or simply omission, cannot be rectified at a later stage (Cole 2013; Julian et al. 2012). A minimum level of quality should therefore be expected from crime scene examiners (hereafter CSEs) and other first responders dispatched to a crime scene.

Still, “quality assurance in crime scene practice is an underdeveloped and underexamined field” (Chowdhury 2021, 564). Debates about the very suitability of quality management strategies for such an endeavor are particularly intensive, with many crime scene investigation providers not being accredited (Doyle 2019; Neuteboom et al. 2023) and some practitioners and researchers questioning their relevance to the specific objectives and ways of doing things outside the laboratory and the courtroom (Crispino and Roux 2017; Hazard et al. 2014). However, to our knowledge, such debates have largely overlooked how standards may impact social dynamics inherent in the forensic process, despite similar topics being extensively studied in other fields. The present review aims to contribute to these discussions by examining the existing scientific literature on the implementation and institutionalization of regulation and standardization strategies in other professional domains like public administration and policing. Similar to the approach of Wilson-Kovacs and Wyatt (2024), our goal is neither to evaluate the merit of quality standards nor to propose new standards for crime scene investigation. Instead, our focus deeply lies on the social practices and responses to standardization and quality control efforts, rather than on the standards themselves.<sup>1</sup>

## 2 | Forensic Science Regulation and Quality Assurance

### 2.1 | What Is Quality Management and Standardization?

Quality management through the use of standards, also called standardization, can be broadly conceptualized as a process of social regulation and control (Evetts 2009) that seeks to “construct [...] uniformities across time and space, through the generation of agreed-upon rules” (Timmermans and Epstein 2010, 71). This definition is similar to the one provided by International Organization for Standardization (ISO), which define standards as documents “established by consensus and approved by a recognized body that provides for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context” (International Standards Organization, 2013, cited in Robertson et al. 2013, 59). Thus, through enhanced predictability, standardization aims to promote greater homogeneity, or consistency, and ultimately improve organizational efficiency (Brunsson and Jacobsson 2002; Campeau 2018). Standards may define expected professional conduct, delineate occupational goals and responsibilities, articulate procedures such as standard operating procedures (SOPs) for completing tasks within a specific field, and/or establish processes for verifying and certifying compliance (Doyle 2018; Link and Naveh 2006). In doing so, they “provide people an instruction manual on how to navigate their lives [...] at work” (Campeau 2018, 603), while also clarifying the

expectations that “clients” or “customers”<sup>2</sup> can have regarding the quality of the service provided (Meuwly 2024).

### 2.2 | Early Developments in Crime Scene Investigation Regulation

While crime scene processing has not always been considered as part of forensic science (see Crispino 2008; Julian et al. 2021 for a full discussion on the matter), it is now increasingly recognized as a critical stage of the forensic process. The Sydney Declaration that recently proposed a forensic science definition and principles further highlighted the pivotal role of crime scene work as “a scientific and diagnostic endeavour requiring scientific expertise” (p. 2) instead of “a technical exercise in recovering obvious traces” (p. 4) (Roux et al. 2022).

Several studies have shown, in the last decades, that crime scene investigation can hinder the quality, the validity, and the reliability of forensic science. Not only are there significant variations in CSEs’ performances and in the ways crime scenes are processed (Baber and Butler 2012; de Gruijter and Poot 2019; Illes et al. 2019; Kelty et al. 2023; Ludwig et al. 2014), but the Scientific Work Improvement Model (SWIM) report suggested that “behaviour of individual CSEs is one of the biggest determinants of attrition [of traces] (impacting productivity, recovery, identification, and ultimately detection rates)” (Home Office 2007, 7, cited in Ludwig et al. 2014, 78). Crime scene investigation errors have also been found to contribute to miscarriages of justice, laboratories overload, or significant loss of information (Bitzer 2016; Kim Rossmo 2008; Ribaux 2023). Alongside calls for professionalization—such as raising hiring criteria and improving training programs (see Crispino 2022; Kelty and Gordon 2012; Kruse 2020; Robertson et al. 2014)—some researchers and practitioners have advocated for increased standardization of crime scene investigations through the implementation of quality assurance mechanisms (Chowdhury 2021; Horswell and Edwards 1997; NAS 2009; Wilson-Wilde 2018).

The early development of a quality management framework for crime scene investigation quickly shifted away from emphasizing measurement uncertainty and analytical validation. It focused instead on questions of impartiality, independence, and quality of observation-based professional judgment (Chowdhury 2021). Standards for crime scene investigation were also designed to ensure the integrity of the crime scene and any collected trace, as well as to maintain a chain of custody (Julian et al. 2012). These standards can encompass various aspects, including the arrival at the scene, its processing and examination, its recording or documentation, and the validity of the equipment used.

Despite efforts to regulate and standardize crime scene investigation, a recent worldwide survey conducted by Neuteboom et al. (2023) revealed that, compared to other forensic sub-disciplines, crime scene investigation providers had the lowest rate of accreditation, with only 32% of facilities accredited. Similarly, Doyle (2019) found that only two crime scene investigation providers in the United Kingdom were accredited to ISO/IEC 17020 (see Sidebar 1). The study also identified at

### Sidebar 1: Forensic Science and ISO standards

In forensic science, the most popular standards have been ISO/IEC 17025 and ISO/IEC 17020 (Willis 2014; Wilson-Wilde 2018; Zhai et al. 2020). ISO/IEC 17025 is usually used for laboratory settings and is thus relevant for many subfields of forensic science like biology, chemistry and toxicology. It is sometimes also used to regulate crime scene investigation providers. However, in 2012, ISO/IEC 17020 was proposed as a more appropriate standard for crime scene investigation because it is associated with inspection and observation-based methods, comparison of materials and professional judgment (Airlie et al. 2021). While Europe and the United States have preferred ISO/IEC 17020, other jurisdictions like Australia and New Zealand have kept ISO/IEC 17025 or created their own set of Standards, like the AS 5388 series (crime scene investigation lies under the AS 5388.1 Standard “Recognition, recording, recovery, transport and storage of material”). Lately, work has also been undertaken to develop a new standard specifically designed for forensic science. While still in elaboration, the forthcoming ISO/IEC 21043 standard is aimed to “cover the generic methodological and technical aspects of forensic science, independently of the [forensic] discipline in which it is applied” (Meuwly 2024, 2). It also seeks to provide requirements and guidance for both field and laboratory-based processes, from trace recovery to interpretation and reporting.

least two accredited crime scene investigation providers in the European Union, 21 in the United States, and 13 in other regions worldwide. The actual progress and implementation of quality management strategies of crime scene investigation thus appear rather slow (Doyle 2019).

### 2.3 | A Longstanding Debate: Are Quality Management Strategies Fit-for-Purpose?

While there is general agreement about the necessity to ensure the quality of crime scene investigation, Tully et al. (2020) emphasized that “the means by which quality of [...] forensic [science] should be assured has been the topic of intense debate” (p. 3). To put it simply, there are two ‘opposing’ views in these debates. On one side, there are adopters who believe standards, SOPs and current quality assurance mechanisms are a legitimate way to ensure quality in forensic science, mitigate risks of errors and biases, and increase public confidence in the justice system (Doak and Assimakopoulos 2010; NAS 2009; Neuteboom and Ross 2024; Wilson et al. 2018; Wilson-Wilde 2018). It would ensure a minimum quality in each step of the crime scene investigation, whether it is recognizing, detecting, recording, collecting, transporting, or storing traces. Adopters acknowledge that standardization and quality assurance may not be foolproof solutions (Tully et al. 2020), but they believe they still act as safeguards against mishandling and misinterpreting traces and would lead forensic science to be more “scientific,” reliable and accurate (Beckett and Slay 2011; Chowdhury 2021; Horsman et al. 2019; McAndrew et al. 2023; Mnookin et al. 2010; Smith and Horne 2024; Zhai et al. 2020).

On the other side, there are skeptics who question if quality management strategies are fit-for-purpose in forensic science and crime scene investigation (Crispino et al. 2019), and if they have any added value (Neuteboom and Ross 2024). Although financial imperatives are obviously at stake (Heavey et al. 2022; McCartney and Nsiah Amoako 2019), more fundamental oppositions are also involved. Some researchers argue that current issues in forensic science cannot be easily addressed through a simple normative framework. Despite an increasing number of studies in the field (Illes et al. 2019; Kelty et al. 2011, 2023, 2024; Knes et al. 2024), there is still a lack of agreement on relevant competencies, especially cognitive skills, required for forensic science work and crime scene investigation (Neuteboom et al. 2023, 2024). Such a fundamental issue, coupled with the challenges of assessing those skills (Crispino and Roux 2017; Kelty et al. 2024; Ludwig 2016), makes standardization and control a difficult task to fulfill. Additionally, advocates of this position argue that the main challenges lie in the fundamental principles and definition of forensic science. Focusing on the methods and procedures may thus not be sufficient to improve the discipline (Crispino et al. 2019, 2022; Roux et al. 2022). The current form of standardization could unintentionally exacerbate the fragmentation of data, reinforcing isolated workflows across different forensic disciplines. This fragmentation could contribute to the misguided conception that forensic science is a patchwork of disciplines and hinder the further development of forensic intelligence (Crispino et al. 2019; Crispino and Roux 2017; Hazard et al. 2014; Neuteboom et al. 2023; Roux et al. 2021, 2022). Other researchers anticipate that an overreliance on standards and procedures may eventually hinder professional judgment and innovation in investigative decision-making (Willis 2010, 2011, 2014). Will CSEs no longer be able to intervene in situations for which no standardized procedures have been developed (Doak and Assimakopoulos 2010)?

Up until now, the debates on the suitability of quality management strategies for crime scene investigation have focused on their purpose and nature to evaluate their theoretical relevance. These disagreements, nevertheless, are linked to a phenomenon long recognized in empirical studies of social regulation. In particular, the dynamics of implementation, adoption, and resistance to rules and standards are intrinsically correlated with sociocultural practices that shape the impact of standardization efforts. Some standards are taken for granted and easily institutionalized, but others are not for various factors (Brunsson and Jacobsson 2002).

## 3 | Lessons From Attempted Standardization of Other Fields

### 3.1 | The Unfruitful Quest for Control and Standardization

Timmermans and Epstein (2010) argued that “standards are invariably introduced into settings already populated by practices, tools, people, and other standards” (p. 79). In this sense, quality management strategies for crime scene investigation are likely to collide with power dynamics and social practices deeply embedded in the routines of CSEs. The scientific literature on

standardization and discretion in various professional fields, particularly in policing and public administration, offers valuable insights to discuss the implementation of quality management strategies in crime scene investigation.

Over the years, the bureaucratization and *scientification* (Ericson and Shearing 1986) of modern police work have driven numerous reforms in law enforcement, including efforts to better control police discretion and regulate various aspects of patrol officers' and detectives' roles, like interception, arrest, use of force, and interrogation. New surveillance technologies (e.g., body-worn cameras), performance indicators, and administrative rules and procedures inspired by the New Public Management framework have been introduced worldwide. These measures aim to reduce misuse of power and standardize police work, while also enhancing accountability and transparency to the public (Dupont 2003; Gundhus et al. 2022; Huey et al. 2022; Jobard and de Maillard 2015). For example, Ericson and Haggerty (1997) noted that Canadian police officers had to complete a dozen documents after intervening in an incident scene, confirming their bureaucratic burden. Despite these changes and some reforms that successfully regulated discretion (e.g., Gundhus et al. 2022), empirical research in the last decades has consistently shown that police officers resist the fundamental transformation of their work and maintain significant discretion in the way they operate in their routine work (Belur et al. 2014; Chan 1996; Charbonneau et al. 2023; Fyfe 2019; Gundhus 2017; Gundhus et al. 2022, 2023; Kuldova et al. 2024; Monties and Gagnon 2024). Indeed, law enforcement agencies have been described as inverted hierarchies (Monjardet 1996) where discretion increases the closer you are to the frontline. Police officers in the field share considerable latitude in negotiating and (re)interpreting managers' prescriptions based on the unique circumstances they face. They can accordingly define what constitutes real police work, establish priorities, and determine which actions are legitimate and what knowledge should be mobilized (Jobard and de Maillard 2015; Nickels 2007). Such a phenomenon appears to be fairly consistent since it has been documented in very diverse periods, organizations, and social settings, even in recent studies (see Bacon et al. 2023; Charbonneau et al. 2023; Gundhus et al. 2022; Monties and Gagnon 2024).

Early research on police discretion questioned whether adding new rules and procedures effectively structured and regulated officers' ability to decide what to do in the field and how to carry it out (Chan 1996; Goldsmith 1990; Goldstein 1977). With New Public Management strategies in policing having yet to demonstrate any significant empirical improvements or change in operational efficiency (Huey et al. 2022), many police scholars are still questioning the ability of administrative regulation to change police work (Fyfe 2019; Skogan 2008). Some suggested that rules and procedures may not actually guide action, but rather be invoked only after the fact to justify and rationalize decision-making (Chan et al. 2003; Ericson 2007; Mouhanna 2001). These findings highlight the importance of not underestimating police officers' capacity to resist standardization (Gundhus et al. 2022).

Law enforcement agencies are far from being the only public organizations where efforts of standardization have been

made. For example, health care systems also saw a massive movement toward standardization, performance management, audit and monitoring, and stricter regulation to ensure quality and uniformity in the services (Timmermans and Epstein 2010). Many of those organizations however also faced resilience and resistance to change and standardization by practitioners in the field (Gagnon and Mazouz 2019). Teachers, social workers, border officers, and healthcare workers like physicians are just a few examples of what Lipsky (2010) conceptualized as street-level bureaucrats, namely public service professionals who exercise a significant level of discretion in decision-making, despite management's efforts to regulate, control, and standardize their actions (Cheraghi-Sohi and Calnan 2013; Côté-Boucher 2016; Davidovitz and Cohen 2022a, 2022b; Evans and Harris 2004; McGlynn et al. 2003). Despite seeming like an attractive solution, Bowker and Star (1999) cautioned about standardization: "we know from a long and gory history of attempts to standardize information systems that standards do not remain standards for very long, and that one person's standard is another's confusion and mess" (p. 293). Similarly, Sandholtz (2012) noted that the disconnect between managers' requests and street-level practitioners' activities "is perhaps the most replicated finding across studies of standardization [which] have shown that core work processes remain relatively unperturbed by ceremonial certification efforts" (p. 3). Are standards merely "empty shells" serving strategic or symbolic functions in such cases (Timmermans and Epstein 2010)?

### 3.2 | Following a Standard: A Social Practice Embedded in Work Setting and Culture

Many theoretical explanations have been proposed to account for the resistance (and ability to resist) of frontline practitioners to standardization across various fields. Two of these seem to be well suited, in theory, to crime scene investigation and deserve special attention. It has been suggested that police officers and other frontline workers like professors, nurses and social workers, are granted *de facto* discretion because of the particular work settings in which they operate. According to Lipsky's theory of street-level bureaucrats (2010), when there is a combination of insufficient resources, high demands, unpredictable environments, limited monitoring opportunities, and vague or non-consensual goals, discretion arises, enabling workers to resist and reinterpret rules and procedures. Such settings create space for street-level bureaucrats to navigate and negotiate the ambiguities and gray areas of policies, rules and standards, allowing them to better cope with constraints, carry out their roles in the way they believe is most appropriate and deviate from established standards to take into account the unique circumstances of the situation they face (Campeau 2018; Chang and Brewer 2023; Maynard-Moody and Musheno 2000, 2003, 2012). Resistance to standardization is not simply about individuals deeply wanting to resist external changes. Rules, procedures and standards are sometimes ambiguous, requiring practitioners to interpret their meaning and application within a specific context and resolve tensions that may arise between some of these standards. Similarly, Ericson and Haggerty (1997) have emphasized that an abundance of rules may promote discretion.

#### 4 | Crime Scene Investigation and Quality Management: The Key Role of Discretion

Frontline workers could pick and choose which rules or procedures better support their decision. Street-level bureaucrats' discretion would also be exacerbated for some workers, such as police officers or social workers, because they work in the field rather than in formal institutions like hospitals, offices or laboratories. Away from the direct scrutiny of supervisors, street-level bureaucrats maintain a great deal of control on the information and knowledge that is transmitted upward in their organization (Ericson 1981, 1994). Such discretion is often tacitly accepted by supervisors and senior managers as "real world solutions to getting the job done" (Lipsky 2010, 18).

The level of compliance or resistance to standards and procedures is not only dependent on the social environment that allows frontline workers to develop and implement discretionary practices. It is also influenced by the tensions that arise between the culture of field stakeholders and that of managers and decision-makers who seek to regulate. In this regard, standardization is political, as it affects power dynamics between those who "control" and those who are "controlled." Research has shown, particularly in the policing field, that senior managers' objectives and institutional logics are fundamentally different than the ones street-level officers adhere to (Gundhus 2013; Holdaway 1983; Reuss-Ianni 1983). These different perspectives are particularly evident in debates over whether police work can truly be circumscribed in procedures as well as in discussions about the types of knowledge essential to performing duties: can this knowledge be made explicit, or is it only acquirable through individual work experience? Efforts at standardization may thus be seen as a challenge to practitioners' competence and professional skills and as a threat to their occupational identity and culture (Chan 2001; Gundhus et al. 2023; Innes et al. 2005; Monties and Gagnon 2024). Terpstra and Salet (2019) emphasized:

[The] 'implementation gap' [between what is intended and what actually happens] (Hill and Hupe 2009; Terpstra and Fyfe 2015) should not be seen as only a (temporary) consequence of some technical factors and circumstances, such as a lack of resources, skills or professional expertise. Because these implementation problems result from conflicting institutional logics that are strongly embedded in the police and police cultures, it can be expected that these problems will be chronic, an undeniable fact as long as these deep-rooted conflicting perspectives and logics [...] exist (p. 9)

Every profession aspires to autonomous self-determination and has its own aims when defining its field of expertise and legitimate knowledge, making professionalization from outside a challenging task (Evans 2016; Evans and Hupe 2020; Hupe et al. 2015; Kruse 2020; Siegrist 2015). The process of professionalization may also create its own ambiguities, that needs to be managed. Rules and standards' meanings are thus frequently mediated through occupational cultures, emphasizing how informal norms and 'rules-of-thumbs' may structure decision-making and frontline practices more strongly than any abstract, formal procedures (Chan 1996; Jobard and de Maillard 2015; Manning 1977; Skolnick 2011).

Research in sociology, criminology, and public administration has shown that rules, standards, and other formal types of social control and regulation may face resistance, reluctance, and workaround strategies by frontline practitioners. Such social practices may be driven by a desire to maintain autonomy in defining legitimate practices, knowledge, and attitudes, but also by the need for flexibility to navigate ambiguities and reconcile high demands, limited resources, and complex circumstances. Theoretically, the implementation of quality assurance mechanisms to oversee crime scene investigation is likely to challenge existing power dynamics within policing and forensic science, with the full impacts still to be understood.

The limited research available on the subject suggests, however, that CSEs, like other street-level bureaucrats (Lipsky 2010; Maynard-Moody and Musheno 2003), generally possess a certain amount of dynamic discretionary power. The scope of their discretion may well vary according to their professional identity (e.g., sworn police officer vs. civilian staff) or organizational structure and orientation (e.g., mere technician vs. dedicated expert) (Julian et al. 2021; Ludwig et al. 2012; Williams 2004). Such discretionary power would come into play in the exercise of their daily duties and in the definition of practices considered legitimate and effective. A growing body of empirical studies emphasizes significant discrepancies in how crime scene investigation is conducted, both between individuals and across crime scene units. Such differences have been observed in various aspects, including the sequence of actions undertaken and attention span (Baber 2010; Baber and Butler 2012; Chang and Tsai 2022; de Gruijter et al. 2016; Watalingam et al. 2017), the duration of the investigation (Baechler et al. 2015; Brown et al. 2014; de Gruijter et al. 2016; Kelty et al. 2011; Lidén and Almazrouei 2023; Watalingam et al. 2017) and the number, type, and quality of traces that are collected (Bradbury and Feist 2005; de Gruijter et al. 2016; Lidén and Almazrouei 2023; Ribaux 2023; van den Eeden et al. 2016). Variations have also been found in the information that is considered relevant for decision-making (Chang and Tsai 2022; de Gruijter et al. 2016; de Gruijter and Poot 2019; Gardner et al. 2019; Resnikoff et al. 2015; van den Eeden et al. 2017) and in the identification and conversion-to-evidence rates—that is, the proportion of traces ultimately used as evidence relative to the total number collected—(Adderley and Bond 2008; Bruenisholz et al. 2019; NAS 2009; Williams 2004). The underlying reasons for these individual and collective differences are likely numerous—for example, some top-performing CSEs would consistently outperform their colleagues (Kelty et al. 2011, 2023), or organizational cultures may influence practices (de Gruijter and Poot 2019), but they primarily highlight that, in their routine activity, CSEs benefit from a certain amount of discretion to make decisions, define priorities, and interpret crime scenes and traces (Mousseau 2024; Wyatt 2014).

This discretion also seems to extend to the definition of their roles, legitimate knowledge and professional practices. Indeed, the work of Wilson-Kovacs (2014) and Kruse (2020)

has already highlighted the ability of CSEs to resist “professionalization from the outside” and to continue, despite forensic developments, to prioritize field experience over scientific education as a means of producing valid knowledge and learning how to investigate crime scenes (see also Melbourn et al. 2019; Mousseau 2024). van den Eeden et al. (2017) also observed similar counter discourses to standardization, with participants pointing out that police and crime scene investigation work cannot fundamentally be summarized in protocols and that experience and instinct would still be the most important guidelines. More recently, Chowdhury (2021) also argued that “traditionally, scene practitioners have resisted the principles of standardization on the dogma that individuality and uniqueness of each scene would incur it” (p. 564) (see also Lentini 2009). In other words, CSEs would not be able to see how to reconcile crime scene investigation, defined as a case-based endeavor (Roux et al. 2022), with the very idea of homogenizing practices.

Finally, wearing (simultaneously or alternatively) the hats of police officer and/or scientist, or technician and/or professional, CSEs operate within a fragmented sociocultural environment. They must navigate frictions between multiple epistemic and occupational cultures, each with distinct sets of values regarding knowledge, decision-making, and regulatory approaches (Julian et al. 2021; Kruse 2020). These frictions create additional ambiguities for CSEs, requiring them to adapt their professional identity and daily practices to carry out their work, based on both external expectations and their own self-perception (i.e., whether they see themselves primarily as police officers/forensic scientists or technicians/professionals). A priori, there seem to be many similarities between how CSEs may react to standardization and how other street-level bureaucrats like police officers respond to such attempts at regulation.

## 5 | Conclusion

Quality management and standardization of crime scene investigation is a topic that is already preoccupying and will mostly continue to preoccupy researchers, practitioners, and political and strategic decision-makers in the coming years. It is essential not to take a purely defeatist view of quality standards: they may offer a promising avenue for enhancing frontline practices and have successfully improved quality and practices in some areas (Brunsson and Jacobsson 2002; Timmermans and Epstein 2010). However, this advanced review pointed out that implementing and adhering to standards is fundamentally a social practice, deeply entrenched in occupational cultures, workplace settings, and power dynamics. As instruments of social control, standards rarely encounter straightforward acceptance; rather, they are analyzed, adapted, negotiated, or even circumvented by frontline practitioners in many subfields of public administration (Ericson 2007; Evans and Hupe 2020; Gundhus et al. 2022; Lipsky 2010; Wilson-Kovacs and Wyatt 2024). Research on CSEs' practices has demonstrated that, like many other fieldworkers in similar situations, they wield significant discretion in shaping the course of their routine, that is, crime scene investigation (de Gruijter and Poot 2019; Mousseau 2024; Wyatt 2014). Like other professionals who aspire to self-determination, they also enjoy some autonomy in defining their roles and missions,

areas of expertise, and legitimate knowledge and practices (Chowdhury 2021; Kruse 2020; van den Eeden et al. 2017). In a field described as a ‘fragmented ecosystem’ (Morgan 2019), divergent assumptions about what forensic science is or should be persist. The future of crime scene investigation and quality management may be shaped not only by collaborative efforts to focus forensic science around a holistic and common core, as suggested by the Sydney Declaration (Roux et al. 2022), but also by how tensions and power dynamics in the field evolve. Acknowledging the connection between social dynamics and quality management strategies opens new opportunities for professionals involved in quality assurance and crime scene investigation. In particular, critically assessing regulatory mechanisms—both in form and substance—and understanding their actual limitations may allow for the development of strategies to navigate challenges, enhance effective implementation, and maximize impact.

To move forward with the longstanding debate about the suitability of quality management strategies in forensic science and crime scene investigation—are they really fit for purpose? (Ross and Neuteboom 2020), research must move toward better empirical investigations into the actual effects on practices and outcomes—both positive and negative—of these standards in the forensic field. The resolution of these debates cannot rest solely on theoretical or philosophical arguments about the appropriateness of standards and should rather rely on how CSEs engage with these standards in practice. As emphasized by Timmermans and Epstein (2010), there needs to be a shift away from the “simple suggestion that standards or standardization are inherently either good or bad [to a more] careful empirical analysis of the specific (and sometimes unintended) consequences of different sorts of standards” (p. 70). Therefore, as scholars such as Roberta Julian et al. (2021), Dana Wilson-Kovacs (2014; see also Wyatt and Wilson-Kovacs 2019) already advocated, forensic science and crime scene investigation practices should themselves become the focus of sociological inquiry to facilitate genuine improvement in the holistic quality of forensic science. Such analyses will not only enrich our understanding of standardization in forensic science and crime scene investigation but will also provide actionable insights to refine quality management approaches in ways that genuinely support practitioners and the broader goals of the forensic process.

### Author Contributions

**Vincent Mousseau:** conceptualization (lead), funding acquisition (lead), investigation (lead), project administration (lead), writing – original draft (lead), writing – review and editing (lead). **Marie Morelato:** conceptualization (supporting), supervision (equal), writing – original draft (supporting), writing – review and editing (supporting). **Claude Roux:** conceptualization (supporting), supervision (equal), writing – original draft (supporting), writing – review and editing (supporting).

### Acknowledgments

The authors thank the anonymous reviewers for their insightful and constructive comments on this manuscript. Open access publishing facilitated by University of Technology Sydney, as part of the Wiley - University of Technology Sydney agreement via the Council of Australian University Librarians.

## Conflicts of Interest

Claude Roux is the Editor-in-Chief of the journal and was excluded from the peer-review process and all editorial decisions related to the publication of this article. The other authors declare no conflicts of interest.

## Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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## Endnotes

<sup>1</sup>In this review, we focus on the use of standards and accreditation as a quality assurance mechanism, but the argument could easily be extended to other types of regulatory mechanisms such as certification or proficiency testing (see Lentini 2009; Wilson-Wilde 2018, 2021), all of which are part of a comprehensive quality assurance framework.

<sup>2</sup>In forensic science, the difficulty in identifying who the ‘clients’ or ‘customers’ are, particularly when it comes to crime scene investigation, likely contributes to questions regarding whether quality assurance strategies are truly fit-for-purpose (see Crispino and Roux 2017).

## References

- Adderley, R., and J. W. Bond. 2008. “The Effects of Deprivation on the Time Spent Examining Crime Scenes and the Recovery of DNA and Fingerprints.” *Journal of Forensic Sciences* 53, no. 1: 178–182. <https://doi.org/10.1111/j.1556-4029.2007.00634.x>.
- Airlie, M., J. Robertson, M. N. Krosch, and E. Brooks. 2021. “Contemporary Issues in Forensic Science—Worldwide Survey Results.” *Forensic Science International* 320: 110704. <https://doi.org/10.1016/j.forsciint.2021.110704>.
- Amoako, E. N., and C. McCartney. 2021. “The UK Forensic Science Regulator: Fit for Purpose?” *WIREs Forensic Science* 3, no. 6: e1415. <https://doi.org/10.1002/wfs2.1415>.
- Baber, C. 2010. “Distributed Cognition at the Crime Scene.” *AI & Society* 25: 423–432.
- Baber, C., and M. Butler. 2012. “Expertise in Crime Scene Examination: Comparing Search Strategies of Expert and Novice Crime Scene Examiners in Simulated Crime Scenes.” *Human Factors* 54, no. 3: 413–424. <https://doi.org/10.1177/00187208124440577>.
- Bacon, C., B. Heberton, and L. McCann. 2023. “The Limits of ‘Professionalisation From Above’: On the ‘Re-Professionalisation’ of Street-Level Policing in England.” *Criminology & Criminal Justice*: 1–26. <https://doi.org/10.1177/17488958231170153>.
- Baechler, S., D. Cartier, P. Schucany, and O. Guéniat. 2015. “Les interventions de la police scientifique suite à des cambriolages: Quelle est la perception des lésés et y a-t-il lieu de s’en soucier?” *Revue Internationale de Criminologie et de Police Technique et Scientifique* 68, no. 2: 228–247.
- Beckett, J., and J. Slay. 2011. “Scientific Underpinnings and Background to Standards and Accreditation in Digital Forensics.” *Digital Investigation* 8, no. 2: 114–121. <https://doi.org/10.1016/j.diin.2011.08.001>.

- Belur, J., N. Tilley, D. Osrin, N. Daruwalla, M. Kumar, and V. Tiwari. 2014. “Police Investigations: Discretion Denied Yet Undeniably Exercised.” *Policing and Society* 25, no. 5: 439–462. <https://doi.org/10.1080/10439463.2013.878343>.
- Bitzer, S. 2016. “Utility of the Clue: Formalisation of the Decision to Analyse a Trace and Insights Into the Evaluation of the Investigative Contribution of Forensic Science.” Thèse de doctorat. Université de Lausanne.
- Bowker, G. C., and S. L. Star. 1999. *Sorting Things out: Classification and Its Consequences*. MIT Press. <https://doi.org/10.7551/mitpress/6352.001.0001>.
- Bradbury, S.-A., and A. Feist. 2005. *The Use of Forensic Science in Volume Crime Investigations: A Review of the Research Literature*. 43/05; p. 91. Research Development and Statistics Directorate, Home Office.
- Brown, C., A. Ross, and R. G. Attewell. 2014. “Benchmarking Forensic Performance in Australia—Volume Crime.” *Forensic Science Policy & Management: An International Journal* 5, no. 3–4: 91–98. <https://doi.org/10.1080/19409044.2014.981347>.
- Bruenisholz, E., N. Vandenberg, C. Brown, and L. Wilson-Wilde. 2019. “Benchmarking Forensic Volume Crime Performance in Australia Between 2011 and 2015.” *Forensic Science International: Synergy* 1: 86–94. <https://doi.org/10.1016/j.fsisyn.2019.05.001>.
- Brunsson, N., and B. Jacobsson. 2002. *A World of Standards*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199256952.001.0001>.
- Campeau, H. 2018. ““The Right Way, the Wrong Way, and the Blueville Way”: Standards and Cultural Match in the Police Organization.” *Sociological Quarterly* 59, no. 4: 603–626. <https://doi.org/10.1080/00380253.2018.1483782>.
- Chan, J., C. Devery, and S. Doran. 2003. *Fair Cop Learning the Art of Policing*. University of Toronto Press. <http://www.deslibris.ca/ID/418357>.
- Chan, J. B. L. 1996. “Changing Police Culture.” *British Journal of Criminology* 36, no. 1: 109–134. <https://doi.org/10.1093/oxfordjournals.bjc.a014061>.
- Chan, J. B. L. 2001. “The Technological Game: How Information Technology Is Transforming Police Practice.” *Criminal Justice* 1, no. 2: 139–159. <https://doi.org/10.1177/1466802501001002001>.
- Chang, A., and G. A. Brewer. 2023. “Street-Level Bureaucracy in Public Administration: A Systematic Literature Review.” *Public Management Review* 25, no. 11: 2191–2211. <https://doi.org/10.1080/14719037.2022.2065517>.
- Chang, R.-C., and M.-J. Tsai. 2022. “Visual Behavior Patterns of Successful Decision Makers in Crime Scene Photo Investigation: An Eye Tracking Analysis.” *Journal of Forensic Sciences* 67, no. 3: 1072–1083. <https://doi.org/10.1111/1556-4029.14970>.
- Charbonneau, É., Y. Boisvert, and L. Bégin. 2023. “Rule Breaking, Bending, and Workarounds: Police Officers and Chiefs’ Coercion-Discretion of Enforcing State Executive Orders.” *Public Performance & Management Review* 46, no. 3: 536–562. <https://doi.org/10.1080/15309576.2022.2162940>.
- Cheraghi-Sohi, S., and M. Calnan. 2013. “Discretion or Discretions? Delineating Professional Discretion: The Case of English Medical Practice.” *Social Science & Medicine* 96: 52–59. <https://doi.org/10.1016/j.socscimed.2013.07.011>.
- Chowdhury, M. 2021. “A Broken System? Examining the Perilous State of Quality Assurance in Crime Scene Practice.” *Science & Justice* 61, no. 5: 564–572. <https://doi.org/10.1016/j.scijus.2021.07.001>.
- Cole, S. A. 2013. “Forensic Science Reform: Out of the Laboratory and Into the Crime Scene.” *Texas Law Review* 91: 123–136.
- Cole, S. A. 2017. “Who Will Regulate American Forensic Science?” *Seton Hall Law Review* 48: 563–581.

- Côté-Boucher, K. 2016. "The Paradox of Discretion: Customs and the Changing Occupational Identity of Canadian Border Officers." *British Journal of Criminology* 56, no. 1: 49–67. <https://doi.org/10.1093/bjc/azv023>.
- Crispino, F. 2008. "Nature and Place of Crime Scene Management Within Forensic Sciences." *Science & Justice* 48, no. 1: 24–28. <https://doi.org/10.1016/j.scijus.2007.09.009>.
- Crispino, F. 2022. "Why Teach Crime Scene Management to Forensic University Students?" *Science & Justice* 62: 735–739. <https://doi.org/10.1016/j.scijus.2022.07.002>.
- Crispino, F., and C. Roux. 2017. "Forensic-Led Regulation Strategies: Are They Fit for Security Problem-Solving Purposes?" In *The Routledge International Handbook of Forensic Intelligence and Criminology*, edited by Q. Rossy, D. Décary-Hétu, O. Delémont, and M. Mulone, 65–76. Routledge.
- Crispino, F., C. Roux, O. Delémont, and O. Ribaux. 2019. "Is the (Traditional) Galilean Science Paradigm Well Suited to Forensic Science?" *WIREs Forensic Science* 1, no. 6: 1–9. <https://doi.org/10.1002/wfs2.1349>.
- Crispino, F., C. Weyermann, O. Delémont, C. Roux, and O. Ribaux. 2022. "Towards Another Paradigm for Forensic Science?" *WIREs Forensic Science* 4, no. 3: e1441. <https://doi.org/10.1002/wfs2.1441>.
- Davidovitz, M., and N. Cohen. 2022a. "Alone in the Campaign: Distrust in Regulators and the Coping of Front-Line Workers." *Regulation & Governance* 16, no. 4: 1005–1021. <https://doi.org/10.1111/rego.12396>.
- Davidovitz, M., and N. Cohen. 2022b. "Playing Defence: The Impact of Trust on the Coping Mechanisms of Street-Level Bureaucrats." *Public Management Review* 24, no. 2: 279–300.
- de Gruijter, M., and C. J. Poot. 2019. "The Use of Rapid Identification Information at the Crime Scene; Similarities and Differences Between English and Dutch CSIs." *Policing and Society* 29, no. 7: 848–868. <https://doi.org/10.1080/10439463.2018.1434177>.
- de Gruijter, M., C. J. de Poot, and H. Elffers. 2016. "The Influence of New Technologies on the Visual Attention of CSIs Performing a Crime Scene Investigation." *Journal of Forensic Sciences* 61, no. 1: 43–51. <https://doi.org/10.1111/1556-4029.12904>.
- Doak, S., and D. Assimakopoulos. 2010. "Tacit Knowledge: A Needed Addition to SOPs in a Forensic Science Environment." *Forensic Science Policy & Management: An International Journal* 1, no. 4: 171–177. <https://doi.org/10.1080/19409041003636983>.
- Doyle, S. 2018. *Quality Management in Forensic Science*. Academic Press.
- Doyle, S. 2019. "A Review of the Current Quality Standards Framework Supporting Forensic Science: Risks and Opportunities." *WIREs Forensic Science* 2, no. 3: e21365. <https://doi.org/10.1002/wfs2.1365>.
- Dupont, B. 2003. "Évaluer ce que fait la police: L'exemple Australien." *Criminologie* 36, no. 1: 103–120. <https://doi.org/10.7202/006555ar>.
- Ericson, R. V. 1981. *Making Crime: A Study of Detective Work*. Butterworth & Co.
- Ericson, R. V. 1994. "The Division of Expert Knowledge in Policing and Security." *British Journal of Sociology* 45, no. 2: 149–175. <https://doi.org/10.2307/591490>.
- Ericson, R. V. 2007. "Rules in Policing: Five Perspectives." *Theoretical Criminology* 11, no. 3: 367–401. <https://doi.org/10.1177/1362480607079583>.
- Ericson, R. V., and K. D. Haggerty. 1997. *Policing the Risk Society*. University of Toronto Press. <https://www.jstor.org/stable/10.3138/9781442678590>.
- Ericson, R. V., and C. D. Shearing. 1986. "The Scientification of Police Work." In *The Knowledge Society*, edited by G. Böhme and N. Stehr, 129–159. Springer Netherlands. [https://doi.org/10.1007/978-94-009-4724-5\\_9](https://doi.org/10.1007/978-94-009-4724-5_9).
- Evans, T. 2016. *Professional Discretion in Welfare Services: Beyond Street-Level Bureaucracy*. Routledge.
- Evans, T., and J. Harris. 2004. "Street-Level Bureaucracy, Social Work and the (Exaggerated) Death of Discretion." *British Journal of Social Work* 34, no. 6: 871–895. <https://doi.org/10.1093/bjsw/bch106>.
- Evans, T., and P. Hupe, eds. 2020. *Discretion and the Quest for Controlled Freedom*. Palgrave-Macmillan. <https://doi.org/10.1007/978-3-030-19566-3>.
- Evetts, J. 2009. "New Professionalism and New Public Management: Changes, Continuities and Consequences." *Comparative Sociology* 8, no. 2: 247–266. <https://doi.org/10.1163/156913309X421655>.
- Fyfe, N. R. 2019. "The Challenges of Change: Exploring the Dynamics of Police Reform in Scotland." *International Journal of Police Science and Management* 21, no. 4: 196–205. <https://doi.org/10.1177/1461355719889463>.
- Gagnon, S., and B. Mazouz. 2019. "Une introduction à la gestion du changement en contextes et milieux organisationnels publics." In *La gestion du changement en contextes et milieux organisationnels publics*, edited by S. Gagnon and B. Mazouz, 1st ed., 3–18. Presses de l'Université du Québec. <https://doi.org/10.2307/j.ctv1n35ct0.5>.
- Gardner, B. O., S. Kelley, D. C. Murrie, and I. E. Dror. 2019. "What Do Forensic Analysts Consider Relevant to Their Decision Making?" *Science & Justice* 59: 516–523. <https://doi.org/10.1016/j.scijus.2019.04.005>.
- Gestring, B. J. 2023. "Creating Infrastructure and Incentives to Increase Quality in Forensic Science." *Forensic Science International: Synergy* 7: 100435. <https://doi.org/10.1016/j.fsisyn.2023.100435>.
- Goldsmith, A. 1990. "Taking Police Culture Seriously: Police Discretion and the Limits of Law." *Policing and Society* 1, no. 2: 91–114. <https://doi.org/10.1080/10439463.1990.9964608>.
- Goldstein, H. 1977. *Policing a Free Society*. Ballinger PubCo.
- Gundhus, H. I. 2013. "Experience or Knowledge? Perspectives on New Knowledge Regimes and Control of Police Professionalism." *Policing: A Journal of Policy and Practice* 7, no. 2: 178–194. <https://doi.org/10.1093/police/pas039>.
- Gundhus, H. I. 2017. "Discretion as an Obstacle: Police Culture, Change, and Governance in a Norwegian Context." *Policing: A Journal of Policy and Practice* 11, no. 3: 258–272. <https://doi.org/10.1093/police/pax012>.
- Gundhus, H. I., P. Skjevraak, and C. T. Wathne. 2023. "We Will Always be Better Than a Spreadsheet. Intelligence Logic and Crime Prevention in Practice." *European Journal of Policing Studies* 6, no. 1: 27–49. <https://doi.org/10.5553/EJPS/2034760X2022001009>.
- Gundhus, H. I., N. Talberg, and C. T. Wathne. 2022. "From Discretion to Standardization: Digitalization of the Police Organization." *International Journal of Police Science and Management* 24, no. 1: 27–41. <https://doi.org/10.1177/14613557211036554>.
- Hazard, D., E. Stauffer, and P. Margot. 2014. "Forensic Science and the Paradigm of Quality." In *Encyclopedia of Criminology and Criminal Justice*, edited by G. Bruinsma and D. Weisburd, 1773–1782. Springer. [https://doi.org/10.1007/978-1-4614-5690-2\\_141](https://doi.org/10.1007/978-1-4614-5690-2_141).
- Heavey, A. L., G. R. Turbett, M. M. Houck, and S. W. Lewis. 2022. "Toward a Common Language for Quality Issues in Forensic Science." *WIREs Forensic Science* 4, no. 4: e1452. <https://doi.org/10.1002/wfs2.1452>.
- Hill, M., and P. Hupe. 2009. *Implementing Public Policy: An Introduction to the Study of Operational Governance*. SAGE.
- Holdaway, S. 1983. *Inside the British Police: A Force at Work*. Basil Blackwell Publisher Limited.

- Horsman, G., B. Findlay, and T. James. 2019. "Developing a 'Router Examination at Scene' Standard Operating Procedure for Crime Scene Investigators in the United Kingdom." *Digital Investigation* 28: 152–162. <https://doi.org/10.1016/j.diin.2019.01.010>.
- Horswell, J., and M. Edwards. 1997. "Development of Quality Systems Accreditation for Crime Scene Investigators in Australia." *Science & Justice* 37, no. 1: 3–8.
- Huey, L., L. Ferguson, and J. Koziarski. 2022. "The Irrationalities of Rationality in Police Data Processes." *Policing and Society* 32, no. 8: 947–962. <https://doi.org/10.1080/10439463.2021.2007245>.
- Hupe, P., M. Hill, and A. Buffat. 2015. *Understanding Street-Level Bureaucracy*. Policy Press. <http://ebookcentral.proquest.com/lib/umontreal-ebooks/detail.action?docID=2129496>.
- Illes, M., P. Wilson, and C. Bruce. 2019. "Forensic Epistemology: Testing the Reasoning Skills of Crime Scene Experts." *Canadian Society of Forensic Science Journal* 52, no. 4: 1–23. <https://doi.org/10.1080/00085030.2019.1664260>.
- Innes, M., N. Fielding, and N. Cope. 2005. "The Appliance of Science? The Theory and Practice of Crime Intelligence Analysis." *British Journal of Criminology* 45, no. 1: 39–57. <https://doi.org/10.1093/bjc/azh053>.
- Jobard, F., and J. de Maillard. 2015. *Sociologie de la police: Politiques, organisations, réformes*. Armand Colin. <https://www.cairn.info/sociologie-de-la-police--9782200603502-page-141.htm>.
- Julian, R., L. Howes, and R. White. 2021. *Critical Forensic Studies*. Routledge. <https://doi.org/10.4324/9780429505782>.
- Julian, R., S. Kelty, and J. Robertson. 2012. "Get It Right the First Time": Critical Issues at the Crime Scene." *Current Issues in Criminal Justice* 24, no. 1: 25–37.
- Kelty, S. F., and H. Gordon. 2012. "Professionalism in Crime Scene Examination: Recruitment Strategies, Part 2: Using a Psychometric Profile of Top Crime Scene Examiners in Selection Decision Making." *Forensic Science Policy & Management: An International Journal* 3, no. 4: 189–199. <https://doi.org/10.1080/19409044.2013.858799>.
- Kelty, S. F., P. R. Joshua, and J. Robertson. 2024. "Building on the Critical Skills Framework of Top Crime Scene Examiners to Recruit High-Caliber Crime Scene Investigation Candidates." *WIREs Forensic Science* 6, no. 5: e1519. <https://doi.org/10.1002/wfs2.1519>.
- Kelty, S. F., R. Julian, and J. Robertson. 2011. "Professionalism in Crime Scene Examination: The Seven Key Attributes of Top Crime Scene Examiners." *Forensic Science Policy & Management: An International Journal* 2, no. 4: 175–186. <https://doi.org/10.1080/19409044.2012.693572>.
- Kelty, S. F., O. Ribaux, and J. Robertson. 2023. "Identifying the Critical Skillset of Top Crime Scene Examiners: Why This Matters and Why Agencies Should Develop Top Performers." *WIREs Forensic Science* 5, no. 5: e1494. <https://doi.org/10.1002/wfs2.1494>.
- Kim Rossmo, D. 2008. *Criminal Investigative Failures*. CRC Press. <https://doi.org/10.1201/9781420047523>.
- Knes, A. S., M. de Gruijter, M. C. Zuidberg, and C. J. de Poot. 2024. "CSI-CSI: Comparing Several Investigative Approaches Toward Crime Scene Improvement." *Science & Justice* 64, no. 1: 63–72. <https://doi.org/10.1016/j.scijus.2023.11.009>.
- Kruse, C. 2020. "Swedish Crime Scene Technicians: Facilitations, Epistemic Frictions and Professionalization From the Outside." *Nordic Journal of Criminology* 21, no. 1: 67–83. <https://doi.org/10.1080/2578983X.2019.1627808>.
- Kuldova, T., H. O. I. Gundhus, and C. T. Wathne, eds. 2024. *Policing and Intelligence in the Global Big Data Era, Volume II: New Global Perspectives on the Politics and Ethics of Knowledge*. Springer Nature Switzerland. <https://doi.org/10.1007/978-3-031-68298-8>.
- Lentini, J. 2009. "Forensic Science Standards: Where They Come From and How They Are Used." *Forensic Science Policy and Management* 1: 10–16. <https://doi.org/10.1080/19409040802596315>.
- Lidén, M., and M. A. Almazrouei. 2023. "Blood, Bucks and Bias": Reliability and Biasability of Crime Scene Investigators' Selection and Prioritization of Blood Traces." *Science & Justice* 63, no. 2: 276–293. <https://doi.org/10.1016/j.scijus.2023.01.005>.
- Link, S., and E. Naveh. 2006. "Standardization and Discretion: Does the Environmental Standard ISO 14001 Lead to Performance Benefits?" *IEEE Transactions on Engineering Management* 53, no. 4: 508–519. <https://doi.org/10.1109/TEM.2006.883704>.
- Lipsky, M. 2010. *Street-Level Bureaucracy, 30th Anniversary Edition: Dilemmas of the Individual in Public Service*. Russell Sage Foundation.
- Ludwig, A. 2016. "E 'Value' Ating Forensic Science." *Forensic Science Policy & Management: An International Journal* 7, no. 3–4: 69–80. <https://doi.org/10.1080/19409044.2016.1177863>.
- Ludwig, A., T. Edgar, and C. N. Maguire. 2014. "A Model for Managing Crime Scene Examiners." *Forensic Science Policy & Management: An International Journal* 5, no. 3–4: 76–90. <https://doi.org/10.1080/19409044.2014.978416>.
- Ludwig, A., J. Fraser, and R. Williams. 2012. "Crime Scene Examiners and Volume Crime Investigations: An Empirical Study of Perception and Practice." *Forensic Science Policy & Management: An International Journal* 3, no. 2: 53–61. <https://doi.org/10.1080/19409044.2012.728680>.
- Manning, P. K. 1977. *Police Work: The Social Organization of Policing*. MIT Press.
- Maynard-Moody, S., and M. Musheno. 2000. "State Agent or Citizen Agent: Two Narratives of Discretion." *Journal of Public Administration Research and Theory: J-PART* 10, no. 2: 329–358 JSTOR.
- Maynard-Moody, S., and M. Musheno. 2003. *Cops, Teachers, Counselors: Stories From the Front Lines of Public Service*. University of Michigan Press.
- Maynard-Moody, S., and M. Musheno. 2012. "Social Equities and Inequities in Practice: Street-Level Workers as Agents and Pragmatists." *Public Administration Review* 72, no. s1: S16–S23. <https://doi.org/10.1111/j.1540-6210.2012.02633.x>.
- McAndrew, W. P., P. J. Speaker, and M. M. Houck. 2023. "Interpol Review of Forensic Management, 2019–2022." *Forensic Science International: Synergy* 6: 100301. <https://doi.org/10.1016/j.fsisyn.2022.100301>.
- McCartney, C., and E. Nsiah Amoako. 2019. "Accreditation of Forensic Science Service Providers." *Journal of Forensic and Legal Medicine* 65: 143–145. <https://doi.org/10.1016/j.jflm.2019.04.004>.
- McGlynn, E. A., S. M. Asch, J. Adams, et al. 2003. "The Quality of Health Care Delivered to Adults in the United States." *New England Journal of Medicine* 348, no. 26: 2635–2645. <https://doi.org/10.1056/NEJMs022615>.
- Melbourn, H., G. Smith, J. McFarland, et al. 2019. "Mandatory Certification of Forensic Science Practitioners in the United States: A Supportive Perspective." *Forensic Science International: Synergy* 1: 161–169. <https://doi.org/10.1016/j.fsisyn.2019.08.001>.
- Meuwly, D. 2024. "Implications of the Forthcoming Forensic Sciences Standard ISO/IEC 21043 for Forensic Biometrics." In *2024 12th International Workshop on Biometrics and Forensics (IWBF)*, 1–6. IEEE. <https://doi.org/10.1109/IWBF62628.2024.10701603>.
- Mnookin, J. L., S. A. Cole, I. E. Dror, and B. A. Fisher. 2010. "The Need for a Research Culture in the Forensic Sciences." *UCLA Law Review* 58: 725.
- Monjardet, D. 1996. *Ce que fait la police: Sociologie de la force publique*. La Découverte.
- Monties, V., and S. Gagnon. 2024. "Responding to Reforms: Resilience Through Rule-Bending and Workarounds in the Police Force." *Public*

- Management Review* 26, no. 1: 142–161. <https://doi.org/10.1080/14719037.2022.2070242>.
- Morgan, R. M. 2019. “Forensic Science. The Importance of Identity in Theory and Practice.” *Forensic Science International: Synergy* 1: 239–242. <https://doi.org/10.1016/j.fsisyn.2019.09.001>.
- Mouhanna, C. 2001. “Faire le gendarme: De la souplesse informelle à la rigueur bureaucratique.” *Revue Française de Sociologie* 42, no. 1: 31–55. <https://doi.org/10.2307/3322803>.
- Mousseau, V. 2024. “L’orientation des stratégies de recherche de traces matérielles par les techniciens en identité judiciaire: Entre savoirs occupationnels et pouvoir(s) discrétionnaire(s)” Thèse de doctorat, Université de Montréal.
- NAS. 2009. *Strengthening Forensic Science in the United States: A Path Forward*. National Research Council of the National Academies, National Academies Press.
- Neuteboom, W., and A. Ross. 2024. “Shall the Twain Ever Meet?” *Australian Journal of Forensic Sciences*: 1–7. <https://doi.org/10.1080/00450618.2024.2363823>.
- Neuteboom, W., A. Ross, L. Bugeja, S. Willis, C. Roux, and K. Lothridge. 2023. “Quality Management in Forensic Science: A Closer Inspection.” *Forensic Science International* 358: 111779. <https://doi.org/10.1016/j.forsciint.2023.111779>.
- Neuteboom, W., A. Ross, L. Bugeja, S. Willis, C. Roux, and K. Lothridge. 2024. “Quality Management and Competencies in Forensic Science.” *WIREs Forensic Science* n/a, no. n/a: e1513. <https://doi.org/10.1002/wfs2.1513>.
- Nickels, E. L. 2007. “A Note on the Status of Discretion in Police Research.” *Journal of Criminal Justice* 35, no. 5: 570–578. <https://doi.org/10.1016/j.jcrimjus.2007.07.009>.
- Pereira, M. 1985. “Quality Assurance in Forensic Science.” *Forensic Science International* 28, no. 1: 1–6. [https://doi.org/10.1016/0379-0738\(85\)90159-8](https://doi.org/10.1016/0379-0738(85)90159-8).
- Pollanen, M. S., M. J. Bowes, S. L. VanLaerhoven, and J. Wallace. 2012. *Forensic Science in Canada*, 113. University of Toronto.
- President’s Council of Advisors on Science and Technology. 2016. *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods* (p. 174). Executive Office of the President.
- Resnikoff, T., O. Ribaux, A. Baylon, M. Jendly, and Q. Rossy. 2015. “The Polymorphism of Crime Scene Investigation: An Exploratory Analysis of the Influence of Crime and Forensic Intelligence on Decisions Made by Crime Scene Examiners.” *Forensic Science International* 257: 425–434. <https://doi.org/10.1016/j.forsciint.2015.10.022>.
- Reuss-Ianni, E. 1983. *Two Cultures of Policing: Street Cops and Management Cops*. Transaction Publishers.
- Ribaux, O. 2023. *De la police scientifique à la traçologie: Le renseignement par la trace*. 2nd ed. EPFL Press.
- Robertson, J., K. Kent, and L. Wilson-Wilde. 2013. “The Development of a Core Forensic Standards Framework for Australia.” *Forensic Science Policy & Management: An International Journal* 4, no. 3–4: 59–67.
- Robertson, J., R. White, S. Kelty, and R. Julian. 2014. “Professionalization and Crime Scene Examination.” *Forensic Science Policy & Management: An International Journal* 5, no. 3–4: 99–111. <https://doi.org/10.1080/19409044.2014.981348>.
- Ross, A., and W. Neuteboom. 2020. “Implementation of Quality Management From a Historical Perspective: The Forensic Science Odyssey.” *Australian Journal of Forensic Sciences* 53, no. 3: 359–371. <https://doi.org/10.1080/00450618.2019.1704058>.
- Roux, C., R. Bucht, F. Crispino, et al. 2022. “The Sydney Declaration—Revisiting the Essence of Forensic Science Through Its Fundamental Principles.” *Forensic Science International* 332: 111182. <https://doi.org/10.1016/j.forsciint.2022.111182>.
- Roux, C., S. Willis, and C. Weyermann. 2021. “Shifting Forensic Science Focus From Means to Purpose: A Path Forward for the Discipline?” *Science & Justice* 61, no. 6: 678–686. <https://doi.org/10.1016/j.scijus.2021.08.005>.
- Sandholtz, K. W. 2012. “Making Standards Stick: A Theory of Coupled vs. Decoupled Compliance.” *Organization Studies* 33, no. 5–6: 655–679. <https://doi.org/10.1177/0170840612443623>.
- Science and Technology Select Committee. 2019. *Forensic Science and the Criminal Justice System: A Blueprint for Change (HL Paper 333)*. House of Lords.
- Siegrist, H. 2015. “Professions and Professionalization, History of.” In *International Encyclopedia of the Social & Behavioral Sciences*, edited by J. D. Wright, 2nd ed., 95–100. Elsevier. <https://doi.org/10.1016/B978-0-08-097086-8.62020-2>.
- Skogan, W. G. 2008. “Why Reforms Fail.” *Policing and Society* 18, no. 1: 23–34. <https://doi.org/10.1080/10439460701718534>.
- Skolnick, J. H. 2011. *Justice Without Trial: Law Enforcement in Democratic Society*. 4th ed. Quid Pro Books.
- Smith, J. H., and J. S. Horne. 2024. “Quality Management System in Forensic Science: An African Perspective.” *Forensic Science International: Synergy* 8: 100476. <https://doi.org/10.1016/j.fsisyn.2024.100476>.
- Sofronoff, W. 2022. *Final Report: Commission of Inquiry Into Forensic DNA Testing in Queensland*. Commission of Inquiry into Forensic DNA testing in Queensland. [https://www.health.qld.gov.au/\\_\\_data/assets/pdf\\_file/0036/1196685/final-report-coi-dna-testing-qld-dec-2022.pdf](https://www.health.qld.gov.au/__data/assets/pdf_file/0036/1196685/final-report-coi-dna-testing-qld-dec-2022.pdf).
- Terpstra, J., and N. R. Fyfe. 2015. “Mind the Implementation Gap? Police Reform and Local Policing in the Netherlands and Scotland.” *Criminology & Criminal Justice* 15, no. 5: 527–544. <https://doi.org/10.1177/1748895815572162>.
- Terpstra, J., and R. Salet. 2019. “The Contested Community Police Officer: An Ongoing Conflict Between Different Institutional Logics.” *International Journal of Police Science and Management* 21, no. 4: 244–253. <https://doi.org/10.1177/1461355719889465>.
- Timmermans, S., and S. Epstein. 2010. “A World of Standards but Not a Standard World: Toward a Sociology of Standards and Standardization.” *Annual Review of Sociology* 36, no. 1: 69–89. <https://doi.org/10.1146/annurev.soc.012809.102629>.
- Tully, G., N. Cohen, D. Compton, G. Davies, R. Isbell, and T. Watson. 2020. “Quality Standards for Digital Forensics: Learning From Experience in England & Wales.” *Forensic Science International: Digital Investigation* 32: 200905. <https://doi.org/10.1016/j.fsid.2020.200905>.
- van den Eeden, C. A. J., C. J. de Poot, and P. J. van Koppen. 2016. “Forensic Expectations: Investigating a Crime Scene With Prior Information.” *Science & Justice* 56, no. 6: 475–481. <https://doi.org/10.1016/j.scijus.2016.08.003>.
- van den Eeden, C. A. J., C. J. de Poot, and P. J. van Koppen. 2017. “From Emergency Call to Crime Scene: Information Transference in the Criminal Investigation.” *Forensic Science Policy & Management: An International Journal* 8, no. 3–4: 79–89. <https://doi.org/10.1080/19409044.2017.1385660>.
- Watalingam, R. D., N. Ricketelli, J. B. Pelz, and J. A. Speir. 2017. “Eye Tracking to Evaluate Evidence Recognition in Crime Scene Investigations.” *Forensic Science International* 280: 64–80. <https://doi.org/10.1016/j.forsciint.2017.08.012>.
- Williams, R. 2004. *The Management of Crime Scene Examination in Relation to the Investigation of Burglary and Vehicle Crime*. Home Office.
- Willis, S. 2010. “Power, Process, People – A Presentation on Quality and Competence in Forensic Science Delivered at EAFS2009.” *Science and Justice* 50, no. 1: 23–25. <https://doi.org/10.1016/j.scijus.2009.11.079>.

- Willis, S. 2011. "The Highs and Lows of Accreditation." *Forensic Science Policy & Management: An International Journal* 2, no. 2: 75–80. <https://doi.org/10.1080/19409044.2011.593607>.
- Willis, S. 2014. "Accreditation — Straight Belt or Life Jacket? Presentation to Forensic Science Society Conference November 2013." *Science & Justice* 54, no. 6: 505–507. <https://doi.org/10.1016/j.scijus.2014.06.001>.
- Wilson, L. E., M. E. Gahan, J. Robertson, and C. Lennard. 2018. "Fit for Purpose Quality Management System for Military Forensic Exploitation." *Forensic Science International* 284: 136–140. <https://doi.org/10.1016/j.forsciint.2018.01.004>.
- Wilson-Kovacs, D. 2014. "Backroom Boys': Occupational Dynamics in Crime Scene Examination." *Sociology* 48, no. 4: 763–779. <https://doi.org/10.1177/0038038513503741>.
- Wilson-Kovacs, D., and D. Wyatt. 2024. "The Long Journey of Resistance Toward Acceptance: Understanding Digital Forensic Accreditation in England and Wales From a Social Science Perspective." *WIREs Forensic Science* 6, no. 1: e1501. <https://doi.org/10.1002/wfs2.1501>.
- Wilson-Wilde, L. 2018. "The International Development of Forensic Science Standards—A Review." *Forensic Science International* 288: 1–9. <https://doi.org/10.1016/j.forsciint.2018.04.009>.
- Wilson-Wilde, L. 2021. "The State of Forensic Science in Australia and New Zealand." *Forensic Science Review* 33, no. 1: 2–7.
- Wyatt, D., and D. Wilson-Kovacs. 2019. "Understanding Crime Scene Examination Through an Ethnographic Lens." *WIREs Forensic Science* no. 6: 1–8. <https://doi.org/10.1002/wfs2.1357>.
- Wyatt, D. 2014. "Practising Crime Scene Investigation: Trace and Contamination in Routine Work." *Policing and Society* 24, no. 4: 443–458. <https://doi.org/10.1080/10439463.2013.868460>.
- Zhai, W., N. Zhang, and F. Hua. 2020. "The Development of Forensic Science Standards in China." *Forensic Science International: Synergy* 2: 187–193. <https://doi.org/10.1016/j.fsisyn.2020.06.001>.