Mandatory certification of forensic science practitioners in the United States: A supportive perspective

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ABSTRACT

The article presented is supportive of mandatory certification of forensic scientists and believes that such a mandate can help establish a threshold for competency in the profession, provide a universal standard for ethical professional conduct, and enhance the credibility of forensic science in users of the profession and the general societal public. After examining the history of professional certification in the United States across a spectrum of professions including forensic science, results of surveys sent to forensic science practitioners to gauge their views on mandatory certification is discussed. Seventy-three surveys were received with most surveyors being in support of mandatory certification related to their discipline. Reasons why many practitioners have chosen not to engage in voluntary certification were also provided on the surveys and discussed. Finally, the article discusses possible ways of implementing mandatory certification and concludes that the mechanisms to achieve this goal may already be in place.

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1. Introduction

In 1989, Eric S. Lander, a molecular biologist, stated “At present, forensic science is virtually unregulated - with the paradoxical result that clinical laboratories must meet higher standards to be allowed to diagnose strep throat than forensic labs must meet to put a defendant on death row” [1]. Medical professionals must make quick, knowledgeable decisions in hospitals every day to treat patients that could be minutes away from death. Lawyers must defend their clients, some of whom are innocent, from a possible life in jail. Forensic scientists handle and analyze evidence which could contain the only link between a suspect, victim, and crime scene. At the root of the three professions, medical professionals, lawyers, and forensic scientists have one thing in common. Each can have a crucial impact on an individual’s life. Although this is true for each, only one of these professions has voluntary certification for practitioners.

Historically, forensic science has been highly unregulated. More recently, however, forensic science has made strides at becoming more regulated as 88% of public sector crime laboratories are accredited (as of 2014) and 98% of crime laboratories conduct proficiency testing [2]. This is in part due to the 2009 National Academy of Sciences report on strengthening forensic science which recommended mandatory laboratory accreditation [3]. As of 2013, ten states and the District of Columbia statutorily require accreditation for some or all scientific disciplines conducted in their forensic laboratories [4].

Although progress is being made towards the accreditation of crime laboratories, certification has not followed the same trend. In 2014, 72% of laboratories employed only one externally certified examiner [2]. Currently, certification of forensic scientists is a voluntary process. The negative implications of voluntary forensic scientist certification can be seen when investigating case exonerations. Barry Scheck and his colleagues investigated 62 DNA exonerations in North America through Cardozo Law School’s Innocence Project and found troubling statistics. In 27% of wrongful convictions, false or misleading testimony by forensic experts was identified. Furthermore, in 63% of the wrongful convictions, forensic science testing errors were identified [5]. It is rationally possible that the true statistics could be higher than reported due to the likelihood that there could be more wrongly convicted individuals still in jail waiting to be exonerated.

With all these staggering statistics, it is alarming that the certification of forensic scientists is still a voluntary process. The certification process is an essential method of evaluating the competence of analysts as well as leveling the standards across the

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country for forensic scientists. While this process should be crucial for forensic scientists, many individuals are not certified due to costs and the fear of failure, according to survey responses to be discussed later in this article. Many argue that the certification exams given by the American Board of Criminalistics contain too many general knowledge questions which appear to be extraneous to an analyst with a specialized area of knowledge. In addition, some believe that years of experience is a better measure of competency than certification. This paper will offer an in-depth discussion on the benefits of mandatory certification and possible modes of implementation.

2. History of professional certification in the United States

The beginnings of formal certification in the United States can be traced back to Colonial times with the establishment of licensing for teachers. While regulations and standards have changed, the idea of having to be specially trained and educated to teach has stayed the same. Over time, the history of certification for teachers can be broken down into four parts: colonial to 1789, 1789 to 1860, 1860 to 1910, and 1910 to the present [5]. Before 1789, there was little focus on formal education, and children were not required to attend school. There were no official licensing or certification programs, but permission to teach was generally granted by the Anglican Church. Variations from state to state began early on. In the second period, the licensing of teachers was decided by the authorities in charge, which were on a local level. Each state had different requirements for licensing, but the emphasis on education was increasing. At this point, licenses were only good for a year and only at the school the teacher was employed at.

As the education systems changed, teacher certification also continued to change. Between 1860 and 1910, the preparation of teachers and state boards of education both continued to develop. The authority to license teachers started moving from a local level to the state level. Graduation from college began to be a requirement for becoming a licensed teacher in most states which first occurred in Indiana in 1907 [6]. After 1910, certification regulations and practices changed even more. With the expansion of education, the need for competent teachers increased. As time went on, state education departments began to grow, often mandating more schooling for teachers to become certified. In the Commonwealth of Pennsylvania, there are bachelor level programs as well as alternative education providers that are approved by the state Department of Education that prepare teachers for the required certification exams [7]. There are different types of certificates depending on student age group and subject area.

Ratified in 1791, Amendment X of the Bill of Rights gave states the power to regulate health and formally license physicians based on state medical boards. The first modern licensing authority in the medical field was established in 1873 in Texas. This led to a wider spread of changes in medical licensing and most states had their own type of licensing board and examination program by 1900 [8]. In 1912 the Federation of State Medical Boards (FSMB) was created and decided that there needed to be a national standard for medical practices, instead of each state having their own standards. This decision ensured that patients were receiving the best care and procedures regardless of where they were in the country. The FSMB devised the United States Medical Licensing Examination (USMLE), an exam that must be passed if one wishes to practice medicine in the United States. The USMLE holds all medical professionals to the same standards of knowledge, competency, and attitude, regardless of what school, state, or country they were trained [8].

Specialty boards, which provide additional certification to physicians, allowed for the identification of boundaries and content that defined various medical specialties. The first specialty board to be incorporated was the American Board of Ophthalmology in 1917. At first, undergoing board certification was voluntary, serving merely as an indicator of extra professional achievement. However, as time passed consumers began to recognize board-certified physicians as having a skill set above that of the traditional physician, and therefore favored certified physicians for treatment. The late 1980s and early 1990s saw a dramatic increase in the proportion of board-certified physicians due to the preference of hospitals to hire board-certified physicians and the preference of board-certified physicians in health insurance networks. As of 2002, the American Board of Medical Specialties (ABMS) had incorporated twenty-four medical specialty boards [10].

In 1841, Alabama was the first state to legislatively call for the licensing of those who practice dentistry, although this act was never enforced. Forty-two years later, in 1883, the National Association of Dental Examiners was founded and established uniform standards for the qualification of practitioners. This dental association also administered the dental boards that were required for dental licensure. In 1924, the American Dental Association (ADA) was founded and, unlike the FSMB for physicians, recognized and supported the state’s right to regulate dental licensure. While dental licensure is the business of the states, the ADA has still put forth policies on licensure issues and increased standardization of licensing exams. The ADA board also has the authority to establish standards of practice and conduct for dentists, and therefore has the discretion of taking disciplinary action against those who engage in misconduct [10].

In 1904 the National Association of Boards of Pharmacists (NABP) was created to ensure the public’s health and safety. It established pharmacist competency assessment programs, as well as accreditation programs [11]. Although all of the requirements for pharmacists are not uniform in every state, each state does require a degree and a minimum number of clinical hours, as well as a competency exam and a jurisprudence exam; in 43 states and the District of Columbia, the Multistate Pharmacy Jurisprudence Exam is accepted [12].

Attorneys present an interesting history in regards to professional certification. The first bar exam was given in Delaware in 1763 as an oral examination in front of a judge. It was not until 1855 that the first written bar exam was introduced by the state of Massachusetts [13]. In the 1920’s, a nationwide survey of attorneys concluded that attorneys were tending to focus their practices on certain types of clients, indicating a degree of specialization. However, while physicians are highly encouraged to be board-certified in a particular specialty, the Bar exam is considered to be unitary. This means that attorneys who pass the bar exam are considered to be equally competent in all areas of law and are therefore able to perform any type of work in the legal system [14]. Wisconsin is the only state that does not require passage of the state bar exam of attorneys, provided a candidate has graduated from one of the state’s ABA (American Bar Association) accredited law schools [15].

It is therefore not surprising that the first specialist certification program for lawyers was not approved until 1972 when California developed specialist certification in the areas of criminal law, taxation, and workers compensation. This program was designed to establish a minimum competence in each of the aforementioned fields based on years of experience, involvement in the profession, educational experience, and performance on a written examination. In the following years, New Mexico, Florida, and Texas also established certification programs. The late 1970s to early 1990s saw a dramatic increase in the recognition of specialization certification practices. The lawyer population in the United States essentially doubled during this time period, meaning that there was increased competition in an already competitive market place.

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Specialist certification allowed for the recognition of a single qualified lawyer in a sea of lawyers all looking for business [14].

Engineers use certification to ensure that their clients receive quality services. In order to receive a license, an individual must complete a four-year college engineering degree, work under a Professional Engineer for a minimum of four years, earn a license from their desired state of practice and pass two comprehensive competency exams. To remain certified, Professional Engineers must further their education to demonstrate improvement of their skills. The National Society of Professional Engineers (NSPE), the certifying body for Professional Engineers, states that licensed engineers hold a high degree of responsibility and must uphold to a higher set of standards [16].

Two other professions with certification requirements include social workers and nutritionists/dietitians. The Association of Social Work boards was incorporated in 1979 as the American Association of State Social Work Boards (AASSWB). This group was formed in order to develop an examination which would ensure minimum competency of entry-level social work practitioners to ensure public protection. The first licensing exam took place in 1983 with a total of 464 social workers. Forty years later, more than 50,000 candidates complete the exam annually. The history of nutritionist specialist certification began in 1993 with the establishment of the Board for Certification of Nutrition Specialists (BCNS). This group is the certifying body for the Certified Nutrition Specialist (CNS) as well as the Certified Nutrition Specialist-Scholar (CNS-S) credentials. Overall, the mission of this organization does not differ from those previously discussed. The main focus of this certifying body is to ensure individuals meet the expected standards of a nutrition specialist [17,18].

A timeline of milestones in professional certification in the United States can be found in Fig. 1.

### 3. Professional certification in forensic science

While certification is not currently required for individuals in Forensic Science, there are several associations that offer voluntary certification examinations for bench-level forensic scientists including the American Board of Forensic Toxicology, the International Association for Identification, and the American Board of Criminalistics.

The history of the American Board of Forensic Toxicology (ABFT) is a rather short one. ABFT was organized in 1975 for the purpose of having a certification program in the area of forensic toxicology [19]. While the certification is voluntary, ABFT aims to establish and enhance standards for forensic toxicologists. Another organization, the Forensic Toxicologist Certification Board (FTCB), merged with ABFT in 2014. The certifications and examinations remained under the ABFT name. Bachelor and master’s level scientists are eligible for analyst and diplomate certification, while only doctoral level scientists are eligible for fellow status [20]. As of February 2019, the ABFT has certified 465 practitioners. Practitioners must be employed in a forensic toxicology position at the time they apply for certification. The certification depends on their own personal and professional training and education, as well as a written examination [19,20].

The International Association for Identification (IAI) began in 1915 as the International Association for Criminal Identification as an organization with the goals of improving the identification profession [21]. The word “Criminal” was dropped from the name a few years later in 1918, due to the amount of noncriminal work that was performed by practitioners. After a long period of growth, the IAI produced its first certification program in 1977. The program was designed for latent print examiners specializing in fingerprint examinations. Today, the IAI offers several different types of certification in a variety of areas, each having their own set of requirements for eligibility although the one common denominator is extensive training specific to each discipline. IAI currently offers a total of eight certification programs in areas as diverse as forensic art, footwear and tiretrack analysis, bloodstain pattern analysis, and forensic photography/imaging [22]. Over 3000 practitioners in the United States and less than 50 practitioners outside of the United States currently have an IAI certification. Interestingly, while most labs do not require certification for individuals, two labs in Colorado do have policies that require their latent print examiners be certified, which would also be through the IAI (personal

![Fig. 1. Timeline of Milestones in Professional Certification in the United States (respective disciplines are represented with different colors). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)](image-url)
communication, Scott Garrett, Director, Forensic Certification Management Board, IAIA).

For bench-level scientists working in one of the criminalistics disciplines, personal certification is normally associated with the American Board of Criminalistics (ABC). The origin of the ABC can be traced back to the Criminalistics Certification Study Committee (CCSC) which existed from 1975 to 1979. The CCSC was composed of a diverse group of individuals representing different disciplines, professional organizations, and laboratories. Although a plurality of the group supported the development of a criminalistics-based certification program, implementation of such a program did not occur. The California Association of Criminalists (CAC) used the work for the CCSC to develop a certification program which required passage of a certification examination. Those who passed the examination and met the other requirements were issued a Certificate of Professional Competence in Criminalistics.

In response to a perceived notion that many criminalists supported a national certification program, the ABC was established in 1989 with a strong emphasis requiring individuals to have a strong foundation in all forensic science disciplines. In 1993, the CAC examination was retired in favor of the ABC examination which was first given in Boston that very same year. Although strongly supportive of foundational knowledge across a range of criminalistics disciplines, the ABC did recognize the emerging paradigm toward specialization. This led to a two-tier examination process which existed up through 2007. Individuals seeking certification were first required to pass a General Knowledge Examination resulting in Diplomate status upon passing the examination. Bench-level scientists could then seek Fellow status by passing a specialist examination in their particular discipline. Fellow status also required the passage of an annual proficiency test [23].

In 2000, the ABC was persuaded by many in the professional community to begin offering examinations in technical specialties without the requirement of passing a General Knowledge Examination. Two such technical examinations in the areas of drug chemistry and molecular biology were therefore implemented in which a Technical Specialist designation was conferred upon passage of the examination. Even on the technical specialties examinations, questions dealing with core material relevant to all forensic science disciplines were still incorporated.

Soon after, the ABC decided to integrate this one examination format across all disciplines. As a result, the General Knowledge Exam was eliminated in 2008 leaving the specialty examinations as the only exam needed for certification. Upon passage of a specialty examination (given in drug analysis, fire debris, molecular biology, hairs and fibers, paints and polymers, or comprehensive criminalistics), individuals are awarded Diplomate status. Fellow status is awarded after successfully completing a proficiency test in the specialty area [23].

Besides the certifying bodies already discussed, there are numerous other certifying bodies for practitioners across disciplines in forensic science, including the American Board of Forensic Anthropology, American Board of Document Examiners, Board of Forensic Document Examiners, American Board of Forensic Entomology, American Board of Forensic Odontology, Association of Firearm and Toolmark Examiners, American Board of Pathology, International Association of Computer Investigative Specialists, and the American Board of Medicolegal Investigators.

Practitioners who want to become certified by the American Board of Forensic Anthropology (ABFA) must already possess a doctoral degree in a relevant area to forensic anthropology. The examination consists of multiple-choice questions and a laboratory practical and is scheduled on the Monday of the week during the American Academy of Forensic Sciences annual meeting [24].

Document examiners must possess a baccalaureate degree and have sufficient training completed, according to the Scientific Working Group for Forensic Document Examination in order to apply for certification by American Board of Forensic Document Examiners (ABFDE), which was established in 1977. The testing is comprised of a written portion, a practical test, and an oral phase. The oral phase takes place at a meeting or event where three directors are expected to be in order to evaluate the testing performed in the oral phase [25]. Alternatively, certification is also offered by the Board of Forensic Document Examiners (BFDE) which was the first certifying body in this discipline recognized by the Forensic Specialties Accreditation Board. Like the ABFDE, certification from the BFDE requires passage of both a written and performance examination [26].

The American Board of Forensic Entomology (ABFE) certification also requires passing written examination and practical testing; their testing is done once a year and will either coincide with the American Academy of Forensic Sciences annual meeting or the North American Forensic Entomology Association annual conference [27].

The American Board of Forensic Odontology (ABFO) began in 1970 and stemmed from the American Academy of Forensic Sciences which began in 1948. In order to become certified by the ABFO, practitioners must have a dental degree to first apply. The goal of the ABFO is to certify and re-certify as well as stress the needs for continuing education and research. Since ABFO was commissioned, it has given 173 certificates of proficiency in forensic odontology as of 2019 [28].

The Association of Firearm and Toolmark Examiners (AFTE) certification program began in 1988. Practitioners who want to become certified by the AFTE must have a baccalaureate degree, have three years paid experience, and the appropriate training according to the AFTE training manual. There are three areas in AFTE that someone can become certified in: firearm evidence examination and identification; toolmark evidence examination and identification; and gunshot residue evidence examination and identification. The written examination component is offered through the National Forensic Science Technology Center while the practical examination component is mailed directly to a proctor who will administer the test at a suitable location [29].

An exception to voluntary certification, forensic pathologists are required to be certified by the American Board of Pathology, which is a current member of the American Board of Medical Specialties [30]. Applicants for this certification must have completed medical school, possess an unrestricted license to practice medicine, and have completed a program in pathology or a pathology subspecialty. Forensic pathology is the only discipline of forensic science which mandates that practitioners be board-certified. However, this requirement more likely than not demonstrates that the practitioner is competent as a medical doctor rather than demonstrating competence in forensic science.

The International Association of Computer Investigative Specialists (IACIS) was incorporated in 1989 and soon developed a certification program. IACIS certification is a two-step process. The first step is a peer review phase where the candidate completes four scenario-based problems under the mentorship of a computer forensics professional. The second or certification phase consists of a practical and written examination [32].

The American Board of Medicolegal Death Investigators (ABMDI) is the certifying body for death investigators and was founded in 1998. Currently there is a policy and procedures manual for certification by the American Board of Medicolegal Death Investigators (ABMDI) which outlines the certification procedure for death investigation positions [31]. Two levels of certification are available: Registry and Board Certification. Registry Certification is an initial certification which confers that the individual has acquired specialized knowledge and sufficient proficiency in standards of practice to
competently perform a death investigation. Application requirements for the registry examination include a minimum of 640 h of experience as a death investigator. The advanced Board Certification examination is available to experienced registered death investigators and requires a minimum of an Associate’s degree and 4000 h of death investigation experience covering the past six years.

A chronology on the development of certification boards in forensic science in the United States is provided in Table 1.

4. Calls for universal certification in forensic science

A lack of universal, required professional certification in forensic science has often been a basis of criticism of the discipline. In 1991, Jonakait stated that forensic science was not at the level of expectation in practice and held to different standards than other fields [33]. He noted that serologists would be required to type blood evidence from a crime scene; yet, in the medical field a certified professional would perform blood typing.

The level of support for universal certification within the forensic science community is also not clear. In 1984, Grunbaum stated that the forensic science field was vehemently against universal certification [34]. However, it does appear that the idea of universal certification has support within professional organizations associated with the discipline. For instance, all regional forensic science organizations within the United States and several national organizations such as the American Academy of Forensic Sciences and the American Society of Crime Laboratory Directors are member organizations of the American Board of Criminalistics [35].

However, it was not until the 2009 National Academy of Sciences report on strengthening forensic science, that a clear and unambiguous statement supporting universal certification was given the attention of the professional community [3]. The report stated that other professions, such as medicine, already require practitioners to be certified in order to work, so it stands to reason that forensic scientists, whose work and results affect the lives of others, should also be held to standards of certification. The report also mentioned that while accreditation of labs covers the methods used and the way labs operate, it doesn’t hold analysts personally responsible. It is asserted that the implementation of mandatory certification would improve both the quality of work and the credibility of analysts.

Similarly, in September 2016, the National Commission on Forensic Science subcommittee for Accreditation and Proficiency Testing released a document on their views for the certification of forensic science practitioners [36]. In the document, individual certification was called for and must be implemented from robust and standardized certification programs. The first part of the commission’s views included suggestions for forensic science service providers, which included developing a process to be sure that all forensic scientists apply for and maintain certification, as well as providing support for those attempting certification. For the individual, the commission suggested that all forensic scientists should become certified in the areas in which they work. The commission also stated that analysts should receive their certification within five years of the implementation of the document. Since then, the commission has been dissolved and no real moves towards universal certification in forensic science have been made on a national level.

Several months prior to the end of the National Commission on Forensic Science, the President’s Council of Advisors on Science and Technology released a report to the President. This report titled Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods which has since been known in the forensic science community as the “PCAST report,” strongly echoed the calls for practitioner certification that were first mentioned in the National Academy of Sciences’ report [37].

However, the first major step toward mandatory certification of forensic analysts on the state level took place in Texas with the passing of a bill conceived by the Texas Science Commission in 2015. TX SB-1287 required accreditation of all crime laboratories within the state as well as the licensing of forensic analysts [38]. This idea first came about in February 2013 when The Texas Association of Crime Lab Directors (TACLD) started discussion concerning the certification or licensure of forensic analysts. Then in April 2014, a survey was sent to state practitioners evaluating the current state of certification and to determine the demand for such a requirement [39]. Given that the results were in favor of creating a licensing program in Texas, a draft of the bill was sent to legislation in January 2015 with subsequent passage in June.

Even though current certification programs exist for analysts, the TACLD felt that there were faults in these programs that the mandatory licensing would fill. This model was designed to be responsive to developments and changes in forensic science, an aspect which the association felt was not addressed by other certification programs due to the lack of updating. In addition, they felt that the model was a better way to establish and enforce ethical standards that are to be upheld by licensed forensic analysts. Another benefit that was presented with licensing is that it does not require membership which is normally required of current certification bodies [39].

In order to become licensed in Texas, analysts must meet a minimum formal education requirement for their specific area of discipline. One common prerequisite among all disciplines where certification is required is the possession of a minimum of a bachelor’s degree in a science related to forensic science or forensic science from an accredited university. In addition to the degree,

| Board/Association | Year Founded |
|--------------------|--------------|
| American Board of Pathology | 1935 |
| American Board of Forensic Odontology | 1970 |
| American Board of Forensic Toxicology | 1975 |
| International Association for Identification Certification Program | 1977 |
| American Board of Forensic Anthropology | 1977 |
| American Board of Forensic Document Examiners | 1977 |
| Association of Firearms and Toolmarks Certification Program | 1988 |
| American Board of Criminalistics | 1989 |
| International Association of Computer Investigative Specialists | 1989 |
| American Board of Forensic Entomology | 1996 |
| American Board of Medicolegal Death Investigators | 1998 |
| Board of Forensic Document Examiners | 2000 |
analysts usually must meet specific coursework requirements for each discipline (some disciplines such as document examination do not require coursework). Beginning on January 1, 2019 disciplines subject to licensing include toxicology, firearm/trace examination, seized drugs analysis, document examination, trace evidence examination, and forensic biology [40].

5. Who is certified?

According to the United States Bureau of Labor Statistics, there were 15,400 employed forensic science technicians in 2016 [41]. A report issued in the same year by the National Commission on Forensic Science approximated that about 6556 of forensic science service providers (not counting forensic pathologists) were certified by an organization recognized by the Forensic Specialties Accreditation Board (FSAB), some 43% of all forensic science practitioners [36]. The FSAB is responsible for accrediting certifying bodies (conformity assessment bodies, CABS) in forensic science. This number is likely higher given that not every certifying body in forensic science is accredited by the FSAB. One which is not is the Association of Firearm and Toolmark Examiners (AFTE), which has approximately 200 certified members. AFTE is currently in the research phase of pursuing ISO 17024 accreditation and will likely pursue either FSAB or NCCA (National Commission for Certifying Agencies) accreditation by 2020 [personal communication, Stephen Ostrowski, AFTE Certification Program Chair]. In addition, the International Association for Identification (IAI) discontinued its participation with the FSAB in 2016 because FSAB is not recognized internationally and IAI has a European division (personal communication, Robert Garrett, Forensic Certification Management Board, IAI). The discipline with the most certified members is in the area of digital forensics which has nearly 2000 practitioners certified by the International Association of Computer Investigative Specialists. Perhaps the broad nature of this discipline requiring different types of expertise explains this (for instance, investigations into computers, cell phones, and portable gaming devices). Other areas with a high number of certificate holders include crime scene investigation (1625 from the International Association for Identification), latent fingerprint examination (1041 from the International Association for Identification), and controlled substances analysis (232 from the American Board of Criminalists) [36]. While these numbers are relative to the number of practitioners within each discipline, it is important to observe the trends of certification in order to assess the current certification environment in forensic science.

6. Comments from practitioners on certification

Using various directories, a survey was sent to forensic science practitioners on their views of certification. The authors received 73 responses. Of these individuals, 59 are or had been certified at one point, while 14 were not certified. Of the 59 who had been certified, 43 of them had undergone the re-certification process. In all but a few cases, the practitioners were certified by the American Board of Criminalists, American Board of Forensic Toxicology, or the International Association for Identification. When asked to estimate the percent of certified practitioners at the lab they worked in, the numbers varied greatly from less than 1%–3% to 25% to roughly 80%. Two of the responders indicated that 100% of their labs were certified, but this is because it was required by the State of Texas where they are employed. For several of the American Board of Forensic Toxicology certified responders, certification is required in order to be a laboratory director or to be promoted, but not necessarily for hire. Another responder made it a point to state that their laboratory’s accrediting body, ANSI National Accreditation Board (ANAB), does not require certification of analysts but laboratories in the surrounding area have policies requiring latent print examiners to be certified by the IAI within one year of being hired.

Among those who had undergone a certification process, the general consensus was that the certification exams and process were fair, but one surveyor noted that this feeling could be due to the fact that they had passed the exam. Those practitioners who certified in a specialty felt the exams appropriately represented the skills one should possess from experience in that discipline. If you knew how to do your job, then you should be able to pass these exams was the understanding of one scientist. Among surveyors who disagreed with the test being fair reported that some of the questions were outdated and the test did not accurately represent the work they performed within their discipline.

Generally, surveyors supported mandatory certification and agreed that requiring universal mandatory certification was a positive thing. Some surveyors emphasized the point that many other professions require certification. Other surveyors explicitly stated that it should be reserved for upper management positions. Many responses involved stipulations such as certification should require work in the development of future certification examination or updating current exams. Those not in support of mandatory certification generally reported it was not necessary or had concerns with the certification examination itself. Some surveyors felt that the certification did not actually qualify someone as competent in their field and that mandatory certification could result in overlooking quality candidates.

Responses pertaining to negative aspects of certification were also obtained. When asked for their opinion on any particular reason(s) that a person would not want to become certified or attempt a certification process, many individuals gave varying answers. First, it was mentioned by more than one individual that they do not feel there is enough benefit to outweigh the costs or difficulty of the entire process. In a few surveys, it was mentioned that the analyst either sees no benefits/rewards (promotions, raises, etc.) and that their job does not depend on it so subsequently it does not seem worthwhile to engage in the process. Some individuals also mentioned that for their older and more experienced colleagues who have worked for so long without certification, it is not a priority as they believe their experiences make them credible. It was also mentioned that for these analysts, it is possible that they have been out of college for many years and some did not initially study forensic science, so completing the examination could be difficult.

A majority of surveys (52%) also reported that a major reason individuals do not want to take the exam is the fear of failing the certification examination. A main concern amongst those surveyed was finding the time to study, especially if you are far removed from school and have a full-time career and family. It was noted multiple times that scientists are not given time to study by upper management. This fear goes further as individuals also mentioned the fear of appearing less competent in court if attorneys bring up prior failed certification exams.

Several surveyors (31 of 73) also believe that cost for both certification and recertification factors into the decision not to become certified. Several commented that most laboratories or organizations do not have the means to pay for analysts to become certified, leaving the practitioner to pay not only for the initial examination seating but also travel expenses to the examination site. One respondent also pointed out that many certifying organizations also require analysts to attend conferences and trainings in order to maintain the certification which can incur costs for travel, lodging and registration often not reimbursed by the employer. This could
particularly affect practitioners in the early part of their career where pay may be low and large monthly student loan payments are often an issue.

It was also reported that gathering the necessary documentation of professional activity/continuing education often needed for recertification is a time-consuming and tedious process. One survey, filled by someone who was both a certified forensic scientist and a lawyer, mentioned how filing work for the continuing education requirement is much easier for the bar. They mentioned how their continuing education was tracked and reported to the state bar by the provider removing the risk of losing paperwork.

7. The case for universal certification in forensic science

It has been stated that, at the very least, professional certification establishes a baseline competency for forensic science practitioners. Others have gone further to say that certification demonstrates a mastery of a discipline beyond this baseline competence [39]. Some certification bodies such as Association of Firearm and Toolmark Examiners do not even allow examiners to be eligible for certification until they have five years of casework experience [29]. Regardless of the stance taken, there is a consensus that revoking a professional certification largely reflects a practitioner’s competency by testing their theoretical and practical knowledge, skills and abilities. As stated in the American Academy of Forensic Sciences Good Forensic Practice Guidelines “although competence at a minimum should be a goal, forensic scientists should strive for excellence” [42]. Based solely on this statement alone, certification is highly suggested. The recertification process, depending on the organization, largely requires some form of continuing education or participation in the profession that the certification covers, whether it be through attending workshops, participating in professional organizations, or publishing research. Through these processes, the practitioner has no choice but to stay current with policy changes and scientific advancements, another hallmark of competency. Science also mandates that scientific professionals demonstrate collegiality which makes participating in one's professional community a logical component of certification.

Given that all the certifying bodies mentioned have a code of ethics that certificate holders must abide by, ethics and certification are indisputably linked. The Forensic Specialties Accreditation Board (FSAB) which accredits many of the certifying bodies discussed in this article, list as a requirement the existence of ethical and professional standards [43]. There also needs to be a preset group of policies and procedures that outline any disciplinary actions. This holds the accrediting bodies accountable for having standards that anyone certified must follow.

Being certified does not necessarily mean that one will always be ethical. However, it may be interpreted that by becoming certified, a forensic scientist accepts the ethical requirements of the certifying body and in turn accepts a societal obligation to perform their duties with excellence and integrity. In fact, it is commonplace that each year certificate holders acknowledge their agreement to uphold the ethical and professional standards of the certifying body when submitting evidence of continuing education and professional development. Examining the limited number of ethics and professional conduct violations leading to revocation of certification by various certifying bodies seems to support this. In the last ten years, the American Board of Forensic Toxicology (ABFT) has never revoked certification of a certificate holder due to a violation of ethical and professional conduct (personal communication, Bruce Goldberger, President, ABFT). During this same time period, the American Board of Criminalistics (ABC) did revoke the certification of three individuals charged and convicted of a felony (personal communication, Mike Healy, Registrar, ABC). In none of these cases, was revocation due to an ethics complaint.

Furthermore, certification presents a commitment to excellence that is tangible to the trier of fact, rather than simply being implied in good faith. Wilcox and NicDaedel conducted a study on the perception jurors had of forensic scientists serving as expert witnesses [44]. A number of jurors interviewed for the study indicated that certification was something they believed an expert witness should have. One such juror stated that she believed that the expert witness with certification along with professional experience was credible. This juror later went on to state that she believed expert witnesses were formally licensed by the state in which they're working. Mandatory certification will also make it more difficult for expert witnesses to testify outside of their field of expertise since they would not be certified within that discipline. On the other hand, it would become exceedingly difficult for an opposing side, whether it be the defense or the prosecutor, to discredit the credentials and competency of expert witnesses that are certified.

8. The road to implementation

Mandatory certification of forensic practitioners in the United States has always been and remains controversial. Some of the arguments presented in the surveys discussed in this paper particularly in the area of cost however are not convincing. Costs associated with certification and recertification, for instance, may be challenging but not unreasonable when compared with other professions with certification programs. Certification exams in forensic science typically cost between $250 and $400 dollars. For instance, examination seating for the American Board of Criminalistics and International Association for Identification cost $300 ($400 for IAI examinations for non-members) and $250 for American Board of Forensic Toxicology examinations [45–47]. The cost of an Association of Firearms and Toolmark Examiners examination (both written and practical components) is $250 [29]. In the State of Texas where licensing in mandated, initial examinations cost range from $150–220 depending on the position of the practitioner. Licensing renewal fees occur every two years and cost between $130–$200 [48]. When compared with two other professions with similar salaries, namely social work and dietetics, the cost is only slightly more. Examination costs associated with the Association of Social Work Boards range from $230–260 [49] while the cost of the dietitian certification examination through the Commission on Dietetic Registration is $200 [50]. These fees also do not cover any annual fees payable to an individual’s jurisdiction licensing board. When these are factored in, the cost to be certified in these professions is likely to be more than in forensic science. The American Board of Criminalistics also offers complimentary registration in the form of Ed Rhodes scholarships available to one member annually from member organizations associated with ABC to help offset the cost of the examination [51].

Recertification costs either incurred as a one-time fee at the end of the certification period (International Association for Identification) or assessed annually through a reporting structure for continuing education and professional activity are also not excessive and can range from $250–$500 [46]. For instance, the annual reports cost for American Board of Criminalistics certificate holders is $70–80 while the annual reporting costs for the American Board of Forensic Toxicology is $100 [52,53]. Both certifications cover a five-year period.

The cost of travel to an examination site is also somewhat offset by the willingness of some certifying bodies to conduct examinations at various venues throughout the year. The American Board of Criminalistics typically gives examinations at agency sites provided a required amount of interest exists as does the American Board of
Forensic Toxicology. The American Board of Criminalistics also offers examination at the annual meeting of all regional forensic science organizations in the United States.

The argument that the recertification process can be an impediment to continued certification is also not persuasive. In most cases, certifying bodies offer a variety of mechanisms for certificate holders to achieve the necessary threshold for continuing education and professional development. Activities that can be used to reach this requirement are varied and include participation at professional conferences, being an officer for an organization or committee, publication, and training. It is true that the reporting of these activities can be aided by the group or organization sponsoring the activity, but currently a mechanism is not in place.

With the dissolution of the National Commission on Forensic Science in 2017, it seems unlikely that universal certification of forensic science practitioners will ever happen through a federal entity. However, there are mechanisms in place to achieve this goal on a national level, but given that a consensus supporting universal certification among the forensic science community does not exist, this is unlikely as well. Ideally, the easiest path forward would be for ANSI National Accreditation Board (ANAB) to require certification of all forensic science practitioners through a body accredited under ISO 17024. Given that the new accreditation standards incorporated by the Forensic Specialties Accreditation Board (FSAB) requires conformity assessment bodies (CABs) to adopt ISO 17024 standards [43], most practitioners particularly in forensic science laboratories are in disciplines with a certifying body available to them that falls in this category. The two major certifying bodies governing forensic practitioners in crime laboratories which currently are not accredited by the FSAB are the International Association for Identification and the Association of Firearm and Toolmark Examiners. As mentioned the IAI abandoned its membership in the FSAB in 2016 but has stated publically their goal of obtaining ISO 17024 accreditation [54]. As mentioned, the AFTE is also planning on applying for ISO 17024 accreditation in the coming years.

Having certification operate under a common set of standards, whether it is FSAB or ISO 17024, reduces variability among certifying bodies. An oversight body can ensure that certification processes are fair and impartial, reliable, reduce conflicts of interest, and are subject to due process. It will also guarantee that certification is transferable not only from state to state but in the case of ISO 17024 globally as well. A criticism of the Texas licensing requirements is that it is not transferable to other states (if licensing existed in other states). Having a universal standard for certification would make transfer of certification from jurisdiction to jurisdiction at the very least easy.

Mandated certification may be best achieved at the state level similar to the process used by other professions described in the foregoing. As of 2016, 17 states (Arkansas, Arizona, California, Delaware, Illinois, Indiana, Maryland, Minnesota, Montana, New York, North Carolina, Oklahoma, Rhode Island, Texas, Virginia, and Washington) and the District of Columbia have state boards dedicated to the oversight of forensic science practice in their state, the majority of which were statutorily created [53]. State commissions could adopt certification and/or licensing in a manner similar to the State of Texas except to require certification through a certifying body accredited through FSAB or ISO 17024. If a few more states could mimic the efforts in Texas, it may develop a momentum that other states will follow.

Despite numerous improvements in the practice of forensic science in the United States, particularly in the near-universal accreditation of forensic science laboratories, it is still often viewed with skepticism from other scientists, legal professionals, the media, and the general public. Reaching a goal of universal certification through a common set of processes and standards will help improve the view of forensic science in its detractors. Forensic science will best fulfill its societal mandate if the users of the profession believe that practitioners are competent, ethical, and credible. Universal certification will be a huge step forward to meeting this mandate.

Declaration of interest
None.

CRediT authorship contribution statement

Haley Melbourn: Conceptualization, Methodology, Writing - original draft. Gabriella Smith: Conceptualization, Methodology, Writing - original draft. Jessica McFarland: Conceptualization, Methodology, Writing - original draft. Melissa Rogers: Conceptualization, Methodology, Writing - original draft. Kelsey Wieland: Conceptualization, Methodology, Writing - original draft. Delilah DeWilde: Conceptualization, Methodology, Writing - original draft. Sarah Lighthart: Conceptualization, Methodology, Writing - original draft. Matthew Quinn: Conceptualization, Methodology, Writing - original draft. Alexis Baxter: Conceptualization, Methodology, Writing - original draft. Lawrence Quarino: Conceptualization, Methodology, Writing - original draft.

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