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Current State of Forensic Science Improvement in the United States: Lessons from Wrongful Convictions

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ABSTRACT: Advocates and researchers have made many recommendations for forensic science improvement in the United States. These proposals are often motivated by wrongful convictions related to false or misleading forensic evidence. In many cases, the connection between the proposals and the actual experience of wrongful convictions has not been well defined. Further, recommendations may not have been realizable given the structure of the criminal justice system in the United States and the practical realities of forensic science laboratories. Finally, limited attempts have been made to assess recommendations over time to determine the progress of forensic science improvement and elucidate continuing gaps.

Reports from the Department of Justice, the National Academy of Sciences, and the President's Council of Advisors on Science and Technology are assessed to determine the extent to which their recommendations have been implemented, whether the recommendations align with the actual experience of wrongful convictions, and how the American forensic science community has implemented forensic science improvement. The most successful proposals reflect a broad movement toward quality assurance, improved standards, and organizational improvement in the forensic sciences. Less successful proposals are associated with calls for large federal investments, difficulties in community-wide implementation, or uncertain linkage to foundations in science and practice.

Significant progress has been made in the standardization of reporting and testimony, assessment of the foundational reliability of the disciplines, and DNA mixture interpretation. Significant gaps remain to improve medicolegal death investigation, governance, and the implementation of standards. Improved allocation and use of resources will be required to meet continuing challenges in capacity building, training, and proficiency testing, although past experience indicates that both federal and non-federal funding will be required to address these issues. Continued improvement is needed to address the issues associated with wrongful convictions, although forensic science leaders have demonstrated the ability to prioritize improvement initiatives.

KEYWORDS: Cognitive science, forensic science, improvement, policy, reliability, research, standards, statistics.

INTRODUCTION: CONTEXT OF FORENSIC SCIENCE IMPROVEMENT

DNA and Wrongful Convictions

The advent of DNA technology in the 1990s had an unexpected impact on the criminal justice system. For the first time, large numbers of convicted individuals were exonerated when DNA evidence demonstrated their actual innocence and often identified the actual perpetrator of the crime [31]. Wrongful convictions demonstrated the importance of official misconduct, false confessions, eyewitness misidentifications, and false or misleading forensic evidence, among other factors [96]. Over 700 wrongful convictions associated with false or misleading forensic evidence have now been documented [89]. Research demonstrates a wide range of systemic factors related to forensic evidence in wrongful convictions, most of which are amenable to forensic science improvement strategies [89]. This review will focus on the experience of forensic improvement in the United States, although the lessons learned may be translatable to other contexts.

Agendas for Forensic Science Improvement

To address concerns related to wrongful convictions and other challenges, there have been several attempts to establish an agenda for forensic science improvement in the United States. In 2006, the National Institute of Justice (NIJ) published *Status and Needs of Forensic Science Service Providers: A Report to Congress*, which contained five broad categories of recommendations for capacity building, improved training and education, and research [10]. More recently, in 2019, NIJ published *Report to Congress: Needs Assessment of Forensic Laboratories and Medical Examiner/Coroner Offices* [97]. The recommendations of the 2006 report were largely unmet by the time of the 2019 report, with the exception of rapid expansion of forensic science service provider accreditation, which covered 88% of laboratories by 2014 [100]. The 2019 report highlighted the need for better collaboration among forensic scientists and users of forensic analyses and continuing resource gaps in medicolegal death investigation, especially related to the shortage of certified forensic pathologists.

In 2009, the National Research Council (NRC) of the National Academy of Sciences (NAS) published *Strengthening Forensic Science in the United States: A Path Forward* [55], which was deeply critical of the scientific foundations and practices of forensic science in the United States [56].The NRC report stated, "[I]n some cases, substantive information and testimony based

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John Morgan received his Ph.D. in materials science and engineering from Johns Hopkins University (Baltimore, MD) in 1990; his B.S. in physics is from Loyola University in Maryland, where he is currently an instructor in the Forensic Studies program.

Dr. Morgan's government positions include service as Command Science Advisor for the US Army Special Operations Command, Deputy Director for Science and Technology at the Counter-Terrorism Technical Support Office, and Director of the Office of Science & Technology in the Department of Justice's National Institute of Justice (NIJ). While at NIJ, he received the Service to America medal for his work to expand the nation's capacity to perform DNA analyses. He has also chaired the Interagency Council on Applied Homeland Security Technology.

Dr. Morgan has conducted scientific research and development for the Johns Hopkins Applied Physics Laboratory, RTI International, and the Department of Justice. His research work has encompassed forensic science, law enforcement technology, defense against weapons of mass destruction, optoelectronics, and the root causes of expert errors. Dr. Morgan conducts research related to expert errors with an emphasis on forensic science errors in wrongful convictions. His work includes a landmark analysis of 732 wrongful convictions for NIJ, and a comprehensive textbook on the subject.

Dr. Morgan served eight years in the Maryland House of Delegates, representing Howard and Prince George's counties and serving on the Judiciary, Ethics, and Commerce, and Government Matters Committees. He also served as the Congressional Science Fellow of the American Physical Society. Dr. Morgan provides consulting and training services related to forensic science, law enforcement, security technologies, and organizational improvement. He serves as the Executive Director of the National Association of Forensic Science Boards, which promotes collaboration among state forensic science commissions and boards.