



NATIONAL COMMISSION ON FORENSIC SCIENCE

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Views of the Commission Use of Checklists in Forensic Science

Subcommittee
Human Factors

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Commission Action:

The Commission voted to adopt this Views Document on January 9, 2017, by a more than two-thirds majority vote (94% yes, 3% no, 3% abstain).

Note: This document reflects the views of the National Commission on Forensic Science and does not necessarily represent the views of the Department of Justice or the National Institute of Standards and Technology. The portion of the document directly labeled “Views of The Commission” represents the formal Views of the Commission. Information beyond that section is provided for context. Views documents do not request specific action by the Attorney General, and thus do not require further action by the Department of Justice upon their approval by the Commission. This document does not formally recommend any action by a government entity, and thus no further action will be taken upon its approval by the Commission.

Views of the Commission

It is the view of the National Commission on Forensic Science that it is critical to ensure the precise performance of repetitive activities and avoid bias in all forensic activities. The development of a research agenda may prove valuable to identify specific procedures, programs, or areas of practice for forensic science service providers (FSSPs) or forensic science medical providers (FSMPs) that might benefit from checklist applications. Such targets could then be the focus of forensic research on checklist development, using scientifically proven methods to identify the utility of checklists in forensic science.

Statement of the Issue

That errors can occur in forensic science, as in any discipline, cannot be questioned. Among many other approaches to minimize bias and errors in general, the Human Factors subcommittee opted to examine the use of checklists in a potentially broad range of forensic activities. Motivated by the apparent remarkable initial success of checklist use in health care (particularly in fields of

surgery and infection control) and aviation; the extraordinary commercial success of a lay public book entitled *The Checklist Manifesto*; and a detailed briefing from Jeff Adachi, the public defender for the City and County of San Francisco, on the deployment and widespread adoption of checklists to manage a wide range of processes within his office, the subcommittee chose to examine the peer-reviewed literature regarding the utility and impact of checklists to see what might be relevant in forensic science. We supplemented this review by discussions with experts and actual checklist users.

Background

The use of checklists as a technique for error reduction and safety improvement has been widely discussed in medicine and aviation. Checklists have had some success in these arenas and have been proposed as an approach to:

- Standardize certain forensic procedures and techniques,
- Improve confidence in the accuracy of certain procedures, and
- Reduce the possibility of bias in activities that involve personal judgment.

A detailed consideration of their successes and limitations in medicine leads the Commission to conclude that checklists provide the most benefit to ensuring compliance with well-defined processes or focusing attention to detail when certain tasks are repetitive, and they are most useful and widely embraced when a strong leader advocates for their use in ways that ensure their consistent implementation. To the extent such tasks and/or processes exist in a forensic science arena, their success in aviation and in health care, along with limited anecdotal descriptions of their deployment in a public defense context, provides ample reason to believe that checklists may be useful for FSSPs or FSMPs.

At the same time, research in aviation and health care suggests that even the best checklists can be imperfect in their implementation, with challenges that include avoidance of checklist usage due to user-perceived over-familiarity with tasks or user fatigue, and inappropriate application of checklists for various reasons. Similar research in forensic science would allow for the identification of specific procedures, programs, or areas of practice for FSSPs or FSMPs that might benefit from (or be inappropriate for) checklist applications.

Checklists consist of reminders to follow serial processes. When properly constructed to reflect the correct sequence of tasks or a series of tasks, they can reduce errors of omission or prioritization, ensure task completeness, and reduce bias. Checklists supplement human cognition: studies in cognitive psychology demonstrate that humans have the capacity to keep only some four to seven items in short-term memory at any given time, a limitation that can lead to errors.¹ To compensate for this cognitive lapse, humans use heuristics or short cuts to make quick judgments, some of which may be erroneous or lead to downstream error. In addition, these cognitive deficiencies can, and often do, lead to subconscious biases. Dozens of such biases exist, including those described as framing, representativeness, and availability biases. It is important to appreciate

¹ Checklists are not intended to be used as a substitute for experience, reason, or an approved deviation from the norm if necessary.

that though conscious biases are always a concern, subconscious bias is perhaps a greater concern because people may be not only unaware that they can be skewing their judgment but also unable to eliminate from their subconscious the influence of irrelevant information when making a conclusion.

Widespread checklist use in airplane cockpits before takeoff is credited in part for the exceptional safety record in the aviation industry. An anxious public has long been awed by the complexity of the instrument panel of even modestly large planes, yet in some of the most dangerous airline incidents, it was not a checklist that saved lives but the quick “reflexes” of an expert pilot. In medicine, early dramatic successes in the systematic use of checklists in the operating room and in intensive care units yielded in one case a nearly 50 percent reduction in surgical deaths,² and in another, a 66 percent reduction in catheter-related blood stream infections.³ Dozens of subsequent studies on the utility of checklists have been conducted over the past 5 to 10 years, with somewhat mixed results. Meta-analyses of these studies often find improvements based on checklist use, but they record only modest improvement in process of care (such as adherence to practice guideline) as well as modest decreases in adverse events, morbidity, and mortality.

Analysts have emphasized that a checklist is often only a part of a solution to incompleteness and bias. Beyond the application of a checklist is a careful identification of the problem to be solved, precise identification of the steps required to solve a problem or carry out a procedure, extensive feedback on the use of the checklist, and an assessment of cultural hurdles consequent on preliminary implementations. Experts have warned that extensive deployment of checklists without an appreciation of how or why they work may even have a negative impact on clinical outcomes.

Notwithstanding the mixed data regarding checklist use in other disciplines, checklists have been employed with enthusiasm in the criminal justice system, including by the San Francisco public defender, who has developed more than 50 checklists to manage particular litigation case processes (e.g., steps to take when investigating an alleged sexual assault, questions to ask when cross-examining a forensic analyst on DNA evidence).⁴ Although there are obvious environmental differences between FSSPs and public defenders, Jeff Adachi, San Francisco’s elected public defender, provides a great deal of anecdotal evidence that checklists can be implemented effectively in a criminal justice context, and he has initiated some research to provide improved causative/impact analysis.

In addition, some forensic laboratories have implemented checklists successfully, suggesting that certain laboratory tasks that require precision and strict sequential approaches might well be strong candidates for checklist use. We also believe that other non-laboratory procedures might benefit from checklist use. Accordingly, our view is that further study on the deployment of checklists in forensic science environments may prove useful.

² Haynes A, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med.* 2009; 360: 491-499.

³ Pronovost P, et al. An intervention to decrease catheter-related bloodstream infections in the ICU. *N Engl J Med.* 2006; 355:2725-2732.

⁴ These examples are the authors’ and are meant to be exemplary, not actual checklists in use at the SF public defender’s office.