A Cognitive Aid Improves Adherence to Guidelines for Critical Endotracheal Intubation in the Resuscitation Room

A Randomized Controlled Trial With Manikin-Based In Situ Simulation

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Introduction: Emergency endotracheal intubation (ETI) is a high-risk procedure. Some of its adverse events are life-threatening, and guidelines emphasize the need to anticipate complications by thorough preparation. The emergency department (ED) can be an unpredictable environment, and we tested the hypothesis that a cognitive aid would help the emergency practitioners better follow guidelines. The main objective of this study was to determine whether the use of a cognitive aid focusing on both preintubation and postintubation items could improve ETI preparation and implementation in the ED resuscitation room regarding adherence to guidelines. The secondary objective was to measure and describe procedure times.

Methods: We conducted a single-blind randomized controlled trial with manikin-based in situ simulation. The participants were not aware of the purpose of the study. The cognitive aid was developed using national guidelines and current scientific literature. The most relevant items were the preparation and implementation of a rapid sequence induction for ETI followed by mechanical ventilation. Emergency department physician-nurse pairs were randomized into a "cognitive aid" group and a "control" group. All pairs completed the same scenario that led to ETI in their own resuscitation room. An adherence to guidelines score of 30, derived from the 30 items of the cognitive aid (1 point per item), and preparation and intubation times were collected.

Results: Seventeen pairs were included in each group. Adherence to guidelines scores were significantly higher in the cognitive aid group than in the control group (median = 28 of 30, interquartile range = 25–28, vs. median = 24 of 30, interquartile range = 21–26, respectively, $P < 0.01$). Preparation, intubation, and total procedure times were slightly longer in the cognitive aid group, but these results were not significant.

Conclusions: In an in situ simulation, a cognitive aid for the preparation and implementation of an emergency intubation procedure in the ED resuscitation room significantly improved adherence to guidelines without increasing procedure times. Further work is needed in a larger sample and in different settings to evaluate the optimal use of cognitive aids in critical situations.

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Key Words: Emergency medicine, cognitive aid, emergency endotracheal intubation, in situ simulation, manikin-based simulation, randomized controlled trial.

Emergent endotracheal intubation (ETI) is a high-risk procedure, which includes patient preparation, the choice and preparation of intubation equipment allowing a safe procedure, the intubation itself, and control of the success of ETI. Complications related to intubation are usually described as mild or life-threatening. Life-threatening complications, such as severe hypoxemia, severe collapse, cardiac arrest, and death, are related to hemodynamic alterations and difficult oxygenation or ventilation.[1,2] Mild complications include difficult intubation, esophageal intubation, and pulmonary aspiration.[1] Emergency situations may cause emotional distress in medical teams. Cognitive overload may occur in case of infrequent procedures if too many unusual tasks have to be managed and too much information has to be gathered and integrated at the same time. Severity and infrequent situations, time pressure, and stressful environment increase the risk of cognitive overload and underperformance. These conditions are especially encountered in emergent intubation.[3,4] Airway management guidelines emphasize that complications could be avoided or reduced by considering different safety steps during ETI preparation and planning, such as assessment for difficult mask ventilation, difficult intubation, hemodynamic status optimization, oxygenation optimization, or esophageal intubation immediate recognition.[5–9] As in other high-risk settings, cognitive aids have been developed to improve performances and

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avoid forgetting critical steps during a crisis.[10] Cognitive aids are thought to mitigate cognitive overload and optimize performance.[10–14] The benefit of cognitive aids in surgical crises has been suggested in several studies conducted in both surgery and anesthesiology settings, including some in simulated conditions.[15] However, 2 studies have reported conflicting results regarding the value of checklists during ETI in an intensive care unit (ICU). The first study highlights that an intubation management protocol can reduce immediate life-threatening complications.[6] Conversely, a multicenter trial concluded that a preprocedure checklist does not increase the lowest arterial oxygen saturation or lowest systolic during ETI of critically ill adults.[16]

In a pediatric emergency department (ED), a checklist was part of a program to improve the quality and safety of rapid sequence intubation (RSI).[17] We built our own cognitive aid to help practitioners prepare and implement intubation according to British and French guidelines and to study its role for ETI in the ED resuscitation room. The main objective of this study was to determine whether the use of a cognitive aid focusing on both preintubation and postintubation items could improve ETI preparation and implementation in the ED resuscitation room regarding adherence to guidelines. The secondary objective was to measure and describe procedure times.

METHODS

Study Design

We conducted a 2-center single-blind randomized controlled trial (RCT) with manikin-based in situ simulation in the ED resuscitation rooms of Le Havre General Hospital (Le Havre, France) and Rouen University Hospital (Rouen, France). Our local institutional review board approved the study, with its blinding requirement that participants would be informed of the real objective of the study only after the end of the study.

Participants

Study participants were ED physicians and nurses in the 2 centers [a university teaching hospital with a high-volume ED (110,000 patients per year) and a general hospital with a medium volume ED (55,000 patients per year)]. Volunteer physicians and nurses were recruited to participate in a simulation-based study of a common life-threatening emergency. Physicians were randomized into a CA group and a control group with a 1/1 ratio stratified by center and by physicians' seniority in emergency medicine (keamk.com randomization software). For practical reasons, nurses were not randomized, and physician-nurse pairs were constituted each study day depending on nurse availability and time constraints (at the discretion of the head nurse). Neither physicians nor nurses could choose their pair or know their name in advance. Inclusion criteria were nurses and physicians who worked at least half of their hours in the ED and who were authorized to work in the resuscitation room. The only exclusion criterion was failure to provide informed consent.

Study Procedures

As different cognitive aid formats exist, we chose to build ours as a "memory aid" (see Text Document, Supplemental Digital Content 1, http://links.lww.com/SIH/A721), rather than a checklist or a flowchart, based on literature data.[18,19] Items were determined from French and British guidelines on intubation from multiple references, including publications within ICU settings, and were focused on difficult intubations.[1,2,5,7–9,20,21] Included items were structured in five components: equipment and patient positioning, hemodynamic optimization, respiratory optimization, drug preparation, and postintubation checks. The cognitive aid, an easy-to-handle 21 × 29-cm laminated sheet, was stored in the usual crash cart. Participants in the 2 groups completed the same scenario, with the cognitive aid (CA group) or without the cognitive aid (control group). Although participants knew that they would be tested in a practical study simulating a life-threatening emergency (ethical need to obtain informed consent), they were blinded to the purpose of the study and the process of randomization. The CA group discovered the cognitive aid during the simulation, but neither the CA group nor the control group was aware that they were being evaluated on their adherence to guidelines for emergency intubation procedure. Control group pairs remained blinded throughout the simulated session. At the start of the session, participants in the CA group were informed that they would find a document, but they did not know that it was a cognitive aid or when or what it would be used for, but only that they would have to use it. They received no further information or instructions. Simulation sessions were conducted in the resuscitation room of the 2 EDs. Each simulation session started with a reminder of the general rules of simulation work and the features of the training manikin. The physician-nurse pairs were instructed to work as usual; they were free to organize their tasks and to choose and use equipment and treatments as they wished. It was specified that the pairs could access all equipment and medicines in their usual resuscitation room, which were organized and stored as usual. A training manikin (SimMan-ALS; Laerdal Medical, Stavanger, Norway) was brought in to both EDs and positioned supine on a stretcher in the usual resuscitation room. It was controlled remotely away and out of view of the participants. No effort was made to change the routine work environment of the room. If the physician-nurse pairs considered that they needed to use any medicines or medical equipment, they were able to use real medicines and equipment but only those that were available in the room. To address comparability issues in real life, we chose 1 simple scenario of a combined drug and alcohol self-intoxication rapidly leading to coma. The simulated case was identical for all pairs and was preceded by a short introduction detailing the start of the scenario: "A 35-year-old man has just come from home to the ED for a drug and alcohol self-intoxication. He vomited in the ambulance while being transported. He is confused and drowsy." The simulation started on arrival of the team in the resuscitation room. The scenario predicted that the confusion and drowsiness would worsen and lead to coma. Hypoxemia worsened because of aspiration of gastric contents and then bradypnea occurred. Blood pressure decreased until collapse. Inability to protect his own airway due to coma indicated emergency intubation. The manikin was programmed to be normally intubated. Oxygenation and fluid expansion improved hypoxemia and collapse. In the CA group, the cognitive

aid was visibly displayed in the crash cart. The simulation ended when ventilation was achieved using a mechanical ventilator connected to the tracheal intubation tube and when postintubation chest x-ray was requested to confirm endotracheal tube placement. Two evaluators (M.B.H. and M.C.) were present at simulation sessions, one acted as a simulated participant (a nurse aid), who could install equipment and apply instructions but not suggest choices or strategies, the other operated the manikin parameters according to the scenario.

Outcome Measures

Simulation sessions were recorded by 2 video cameras with sound recording. Each participant signed a consent form authorizing the use of the recorded data and undertook not to disclose the scenario or purpose of the study until the study was completed.

The primary outcome was the performance of physician-nurse pairs according to their adherence to guidelines score (of 30 on the grid). The scoring grid comprised 30 items. References for each item are indicated in Table 1. Each item was scored binary as done or not done. Instructions for raters to fill in the grid were specified when there could be ambiguities (Table 1). Several items were combined into 1 single item of the cognitive aid (ie, "mechanical ventilation: setup, circuit, and filter checked" were combined into "mechanical ventilation prepared and checked"). We used a 2-step evaluation. First, evaluation was started live by the manikin operator and continued at the end of the session after discussion with the simulated nurse aid. Second, evaluation was completed or corrected by reviewing camera recordings. One point was attributed to each item if it was completed. Four experts (2 ED physicians and 2 anesthesiologists) rated the 30 items of the cognitive aid in order of importance, and the 5 items with the highest ratings were retained. These 5 essential criteria were suction connected to vacuum and catheter, quantitative capnography ready to use, difficult intubation kit localized or requested if difficult intubation criteria present, preoxygenation, and endotracheal tube placement checked (capnography before switching to mechanical ventilator).

A postsession evaluation form was distributed to each participant after the simulation and filled in real time. It included specialty, physicians' seniority in the ED, previous

TABLE 1. Scoring Grid of Performance of the Physician-Nurse Pairs: Score of Adherence to Guidelines

	Scoring Grid	CA	CG	*P*
1	Self-inflating bag checked, connected to oxygen[7]	17	16	ns
2	Face mask size checked[7,19]	8	3	ns
3	Oropharyngeal airway ready to use*[7]	15	9	0.024
4	Laryngoscope blade size selected[7,19]	16	16	ns
5	Laryngoscope light handle and blade checked[7,19]	17	15	ns
6	Endotracheal tube size selected[7,19]	17	17	ns
7	Endotracheal tube ± stylet lubricated[7,19]	15	13	ns
8	Endotracheal cuff inflation ready = IV syringe requested ready to use[7]	17	16	ns
9	Endotracheal tube holder ready = twill tape or standard tape requested and immediately available[7]	17	14	ns
10	**Suction connected to vacuum and Yankauer (or another catheter)**[4,6,7]	**15**	**17**	ns
11	Mechanical ventilator prepared and checked*[4,6,7]	14	6	0.005
12	Patient monitoring functional, SpO_2, heart rate, blood pressure parameters available[2,3,7]	17	17	ns
13	Patient monitor parameters repeated, BP measurement[2,3,7] *(At least at the beginning and after fluid expansion and just before RSI)*	17	17	ns
14	Venous access checked[7]	17	16	ns
15	Stretcher height adapted[7,19]	13	11	ns
16	Modified Jackson position or intubation head pad modified[7,19]	5	4	ns
17	**Preoxygenation done**[2–6,18,19] *(>3 min; 15 L/min O_2 or noninvasive ventilation)*	**17**	**16**	ns
18	**Difficult intubation kit localized or requested if criteria for difficult intubation***[5,6,19] *(Research for risk for DI clearly spoken out loud, or difficult airway devices clearly located or placed nearby or prepared)*	**14**	**3**	**0.0002**
19	**Capnography (quantitative) ready-to-use***[2–6,18,19]	**15**	**9**	**0.024**
20	Fluid expansion before induction[2–6]	17	16	ns
21	Hemodynamic maintenance = vasopressors considered[2–4,6]	10	8	ns
22	Hypnotic agent (etomidate or ketamine) requested[4–6,18,19]	17	17	ns
23	Hypnotic agent dose spoken aloud[5,6,18] *(Dose clearly stated out loud after nurse prepared or before RSI)*	17	17	ns
24	Neuromuscular blocking agent (succinylcholine) requested[4–6,18,19]	17	17	ns
25	Neuromuscular blocking agent dose requested[5,6,18] *(Dose clearly stated out loud after nurse prepared or before RSI)*	17	17	ns
26	Sedation maintenance prepared or clear decision not to use it[2–4,6]	11	7	ns
27	**Endotracheal tube placement checked = immediate capnography checked**[4–7,18,19]	**13**	**13**	ns
28	Selected intubation detection = auscultation done[7]	17	16	ns
29	Mechanical ventilator switched[7]	17	17	ns
30	Chest x-ray requested[7]	17	17	ns

Essential criteria are in bold and instructions for raters are in italic. Numbers in superscript refer to bibliographic references.
*Significant result at $P < 0.05$ (comparisons assessed with Fisher exact test).
BP, blood pressure; DI, difficult intubation; IV, intravenous; ns, nonstatistically significant.

TABLE 2. Characteristics of the Participants

Characteristics	CA Group (n = 17)	Control Group (n = 17)	*P*
Provider's hospital			
Rouen University Hospital	8	8	
Le Havre General Hospital	9	9	
Seniority in emergency medicine, y			
Physicians	3 (1–8)	2.5 (2–7)	0.82
Nurses	5 (3–8)	4 (2–10)	0.72
Exposure to simulation			
Physicians	16/17	16/17	1.0
Nurses	8/17	4/17	0.28
Situation already encountered in real life			
Physicians	16/17	17/17	1.0
Nurses	17/17	17/17	1.0
Situation already encountered in a simulation-based training			
Physicians	5/17	7/17	0.72
Nurses	1/17	2/17	1.0

Seniority year is expressed in median (IQR).

exposure to simulation, and previous exposure to the situation in real life or in simulation-based training (Table 2). Using a Likert scale, participants rated the usefulness, the ease of use of the checklist, and the realism of the simulation (Table 3). The scale was graduated from 0 (very low) to 5 (very high). Secondary outcomes were procedure times: the preparation time, defined as the time between the decision to intubate and the start of anesthetic induction, and the intubation time, defined as the time between the start of induction and the inflation of the endotracheal tube cuff. The total procedure time was defined as the time between the arrival of the physician-nurse pair in the resuscitation room and the connection of the mechanical ventilator to the tracheal intubation tube and the request for postintubation chest x-ray to confirm endotracheal tube placement. Time data were measured by video viewing.

Statistical Analysis

Randomization of the pairs was stratified by hospital center and by physician seniority in emergency medicine. We estimated that the mean score in the control group would be approximately 70%. We considered that a gain of 20% would be of clinical relevance, as observed in 2 similar studies[11,12] on cognitive aids. The standard deviation was computed using the standard deviations observed in the control group and the interventional groups of 2 similar studies (see Text Document, Supplemental Digital Content 2, http://links.lww.com/SIH/A722). The required number of participants to achieve a 90% minimum power with an α value of less than 5% (BiostaTGV online software) was therefore 30 pairs,[13,14] and 34 pairs were planned to take into account potential exclusions in case of recording failure. Scores of adherences to guidelines and different durations were expressed in median with interquartile range (IQR) and compared between groups by a Wilcoxon test (SAS Studio University Edition 3.5 Software, Cary, NC). Participants' seniority in the ED, previous exposure to high fidelity simulation, and previous exposure to the situation in simulation or in real life were reported. Cognitive aid and control group characteristics were compared for physician or nurse category by a Fisher exact test (seniority) or a Wilcoxon test (simulation experience).

RESULTS

The study was conducted between July 1, 2018, and September 20, 2018. Thirty-four physician-nurse pairs were randomized into 2 groups, CA or control, each of 17 pairs.

The 2 groups were similar in baseline characteristics (Table 2). All physicians had already participated in at least 1 simulation session. Nurses had less simulation experience, but the difference was not significant between groups. Most participants had already been exposed to a similar real-life situation in the ED, in comparable proportions between groups, whether they were physicians or nurses (Table 2).

Adherence to guidelines scores was significantly higher in the CA group than in the control group (median = 28 of 30, IQR = 25–28, vs. median = 24 of 30, IQR = 21–26, respectively, $P < 0.01$; Table 4). The individual items of the cognitive aid are presented with univariate analysis (Table 1). The scores of the 5 essential criteria were also higher in the CA group than in the control group (median = 5 of 5, IQR = 4–5, vs. median 4 of 5, IQR = 3–4, respectively, $P < 0.01$). In univariate analysis, the completion rate of more than half of the criteria was high (>90%) and identical between groups. The items with low completion rates but without a significant difference between groups were the following: face mask size checked, sedation maintenance prepared, Jackson position modified/intubation head pad modified, hemodynamic maintenance considered (fluid expansion or vasopressors), and endotracheal tube placement checked. Four items were significantly more performed in the CA group and account for the global difference: Oropharyngeal airway requested and ready to use, mechanical ventilator prepared and checked, quantitative capnography ready to use, and difficult intubation kit localized or requested if criteria for difficult intubation. The latter 2 items were part of the 5 essential criteria that were considered critical. Screening for difficult intubation criteria and baseline setting of the mechanical ventilator were significantly more performed in the CA group.

The median preparation time was 13.8 minutes (IQR = 9.9–18.1 minutes) for the CA group and 11.8 minutes (IQR = 8.8–13.9 minutes) for the control group, without significant difference. Similarly, the median intubation time was 2.6 minutes (IQR = 2.0–3.9 minutes) for the CA group and 2.4 minutes (IQR = 1.9–3.0 minutes) for the control group, without significant difference. Total procedure times were not significantly different between the CA group and the control group (Table 4).

TABLE 3. Participants' Assessment of the Realism of the Simulation and the Cognitive Aid

	CA Group (n = 34)	Control Group (n = 34)	*P*
Realism			
Environment (0: very low to 5: very high)	5 (4–5)	4 (4–5)	0.31
Manikin (0: very low to 5: very high)	4 (3–4)	4.0 (3–4)	1.0
Scenario (0: very low to 5: very high)	5 (4–5)	5 (5–5)	0.25
CA seem to CA users			
Useful (0: not at all to 5: very)	4 (3–5)	—	—
Easy to use (0: not at all to 5: very)	4 (3–5)	—	—

Assessment of realism is expressed in median (IQR).

TABLE 4. Adherence to Guidelines Score and Procedure Times

	CA Group	Control Group	*P*
Total adherence score	28/30 (25–28)	24/30 (21–26)	0.002
"Essential criteria" score	5/5 (4–5)	4/5 (3–5)	0.003
Preparation time, min	13.8 (9.9–18.1)	11.8 (8.8–13.9)	0.29
Intubation time, min	2.6 (2.0–3.9)	2.4 (1.9–3.0)	0.49
Total time, min	28.6 (23.0–30.9)	23.0 (21.0–30.9)	0.45

Data are expressed as median (IQR).
Preparation time: from ETI decision to induction; intubation time: from induction to inflation tube cuff;
Total time: from participants' arrival to x-ray confirmation.

Most participants considered the manikin, the environment, and the scenario to be very realistic (Table 3). In the CA group, on Likert scales ranging from 0 to 5, usefulness was rated at 4^{3-5} and ease of use was rated at 4^{3-5} (Table 3). Although it was not one of the study objectives, postprocedure video viewing revealed that the cognitive aid had been consulted an average of 10 times per simulation for a total average reading time of 86 seconds per simulation session. For 3 sessions, the cognitive aid had been placed out of the video camera field and the reading time could not be quantified. All participants in the CA group used the cognitive aid but in different ways. In most pairs, only the physician used the cognitive aid. The text was either read silently or aloud to the team. Most of the time, cognitive aid items were read step-by-step throughout the course of the procedure and more rarely as a final check before intubation. The cognitive aid was rarely used after intubation. After endotracheal tube insertion, the cognitive aid was often placed next to the monitor and was much less read than before intubation.

DISCUSSION

Our results show that a cognitive aid for endotracheal intubation improves adherence to guidelines in an in situ simulation in ED. The cognitive aid benefit seemed particularly related to 4 items, including 2 from the 5 essential criteria: screening for difficult intubation and quantitative capnography ready to use. Although the improved score was statistically significant, it did not reach the threshold that we expected. The mean score in the control group was 10% higher than the 70% that we had estimated from references, which made the threshold of 20% difficult to reach. However, we have shown that the improvement concerned some criteria that were considered as essential, supporting the clinical relevance of our results.

We chose to perform a manikin-based in situ simulation in an RCT. Assessment by RCT of rarely performed procedures in real-life critical situations is limited by different obstacles, as exposure of real patients to risks, and ethical aspects, which must be considered. In addition, infrequent and variable situations make statistical analysis difficult to perform. Manikin-based simulation overcomes these obstacles without subjecting real patients to any risks.[22,23] Moreover, in situ simulation is recommended in the healthcare workplace.[24,25] Some authors have conducted in situ simulation-based studies in the ED, as Auerbach et al[26] who evaluated adherence to pediatric cardiac arrest guidelines. To our knowledge, no in situ simulation-based trial has been conducted using a cognitive aid for intubation in the ED. These results are consistent with several published manikin-based simulation RCTs demonstrating the benefit of cognitive aids in critical situations in the operating room, mainly within anesthesia teams. The context of these studies was always a critical situation, such as emergent general anesthesia for C-section,[27] severe arrhythmia, cardiac arrest,[28,29] local anesthetic systemic toxicity,[14] anaphylaxis,[18] or malignant hyperthermia.[29,30]

Adherence to guidelines did not always lead to significant clinical benefits for patients, as shown in a clinical trial assessing a preintubation checklist in an ICU.[16] In our study, the time required to read and to use the cognitive aid increased the preparation time by 2 minutes and the intubation time by 0.2 minutes (12 seconds), compared with controls, but was not statistically significant. A longer time may be safer if it allows for better preparation especially in the absence of respiratory distress as was the case in our simulated situation. On the other hand, care must be taken not to extend the apnea period of risk for aspiration of gastric contents between induction of anesthesia and securing the upper airway. We observed different ways of using the cognitive aid, suggesting an interest to identify the most effective way to use it and to train teams in its use. As Burden et al[29] stated, "Physicians who use cognitive aids expressed great difficulties in reading the aid while gathering clinical information and communicating with the team." A reader or a pilot-copilot model for checklist execution could overcome these problems.[17]

The validity of our results is discussed in accordance with the Kane framework as follows.[31] The scoring validity is supported by the fact that each item in the scoring grid was directly derived from the cognitive aid that was built from guidelines. We based the design of our cognitive aid on preexisting designs and participants found it easy to use. This suggests that its ergonomics were not a limitation to the evaluation of participants' performance.

The study conditions were very close to real-life situations: The workplace environment was exactly the same as in routine practice (equipment and equipment location, means of communication, treatment protocols, monitoring systems, background noise, etc). The only difference was to substitute the patient with a manikin in both groups and to provide a cognitive aid in the CA group. Although we used an enhanced technology manikin, its fixed face aspect, the plastic skin texture, the absence of cyanosis associated with desaturation, and the absence of intraoral secretions may represent biases related to manikin-based simulation. Overall, participants were assessed in real conditions, except perhaps for the fact that a manikin was used and not a real patient, suggesting that participants were exposed to a cognitive and emotional load close to real life. One limitation of the study might be that the participants in the CA group discovered and used the cognitive aid for the first time. They were not as familiar with its use as they would have been if the cognitive aid had already been used and they had trained with it. However, an efficient cognitive aid should be easy to use in all circumstances by anyone, even with minimal training. To limit scoring biases, evaluations were conducted by the same 2 raters across all sessions. The evaluators were necessarily aware of the randomization group, and the study was therefore single blinded. This impact was mitigated by binary scoring (done, not done), an instruction to

complete certain items, and the possibility to review the 2 video camera recordings as necessary. All participants in both groups were evaluated in very similar conditions, and all sessions were conducted in standard conditions: Precautions were taken to blind all participants to the objective of the study (ie, assessment of the intubation procedure performed either with a cognitive aid or without a cognitive aid). Even for participants in the CA group, who discovered the cognitive aid only when it was needed, the specific objective was not revealed. One of the strengths of our study is the in situ simulation design, which ensured an authentic environment. This allows us to state that the observed performance was a good reflection of the "simulated" performance.

The generalization validity may be affected by our recruitment method, which led to selection bias. Pairs were randomized among participants working in an ED, who were blinded and assessed based on a situation that they had already performed. However, the randomization of physicians and nurses was based on volunteers from each ED and not from the total population. Participating physicians and nurses were relatively young, with a mean ED experience of 2.5 and 3 years, respectively. This probably induced a selection bias. Although participants had encountered the simulated situation in real life, the median of seniority in the ED in our sample is quite low and indicates a rather low level of experience relative to real life. Moreover, for the 2 EDs, emergent intubation is a rare and critical situation (between 2 and 5 events per year for each ED physician according to a local survey conducted in our ED). We cannot exclude the fact that the intubation procedure may have been managed differently by more senior practitioners. One strength of our study is that participants were assessed in very similar conditions thanks to the use of a single and reproducible scenario. To avoid confounding factors due to different care options, we chose a simple scenario without diagnostic difficulty for which intubation was the only management option to protect the airway. However, the use of only 1 situation is a limitation to the generalization inference, suggesting a need for different levels of difficulty and different situations (eg, difficult airway management or respiratory distress). However, the more complex the situation, the more confounding factors there are, the more difficult it is for an observer to correctly identify airway management, which exposes the observer to scoring biases. To improve generalization and extrapolation inferences, we need to evaluate the evidence in larger samples and in different settings.

CONCLUSIONS

In an in situ simulation, a cognitive aid for the preparation and implementation of an emergency intubation procedure in the resuscitation room significantly improved adherence to guidelines without increasing procedure times. Further work is needed in a larger sample and in different settings to evaluate the optimal use of cognitive aids in critical situations.

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