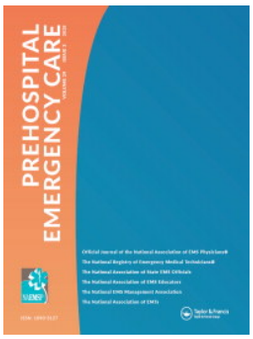

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Paramedic i-gel® Placement and Perception of Use in Prehospital Airway Management

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ABSTRACT

Objectives: Use of supraglottic airways by emergency medical services (EMS) clinicians has increased for patients of all ages. However, data are limited on real-world use in the prehospital setting, including success rates, complications, and paramedic experience. The objective of this study was to determine frequency of successful i-gel® insertion and associated complications, and to describe paramedic perception of i-gel® use.

Methods: This was a prospective study of i-gel® use in adult patients at four fire-based EMS Provider Agencies in Los Angeles (LA) County from June to September 2021. All paramedics received asynchronous and hands-on training prior to implementation. The i-gel® was indicated for adult patients in respiratory and/or cardiac arrest of any etiology, as directed by LA County protocols. Patients were included if a paramedic attempted i-gel® placement at any point. After transition of care, paramedics completed a web-based questionnaire and contacted an on-call EMS physician investigator to discuss the case. Further data were abstracted from the EMS electronic patient care record. The primary outcome was successful placement of i-gel® based on adequate ventilation post insertion confirmed with capnography. Secondary outcomes were frequency of complications and paramedic perceived ease of placement and of ventilation with i-gel® measured on a 5-point Likert scale. Descriptive statistics were reported.

Results: Of the 102 adult patients, 55 (54%) were female and the median age was 69 years (IQR 53–79). The majority 91 (89%) of the patients had a paramedic impression of non-traumatic cardiac arrest. Placement was successful in 90 (88%) patients overall with 85 (83%) i-gel® insertions successful on the first attempt. Complications included: 28 (28%) cases with regurgitation/emesis, bleeding (8, 8%), hypoxia (7, 7%), and dislodgement (5, 5%). Among cases of successful i-gel® placement, the majority of paramedics rated both ease of placement and ease of ventilation as "very easy" (69% and 78%, respectively) or "somewhat easy" (23% and 9%).

Conclusions: Paramedics were successful in 88% of i-gel® insertion attempts with the most common complication being regurgitation/emesis. Paramedics rated the ease of placement and ease of ventilation of the i-gel® device as "very easy" or "somewhat easy" in the vast majority of cases.

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Introduction

Use of prehospital supraglottic airway (SGA) devices for airway management by emergency medical services (EMS) clinicians has increased over the past decade (1). Multiple randomized controlled trials have demonstrated that outcomes with SGA are comparable to endotracheal intubation (ETI) and success of placement is higher (2–4). Based on this evidence, the National Association of Emergency Medical Services Physicians (NAEMSP) issued a position statement in 2021 supporting prehospital SGAs, including i-gel® devices, as a primary or secondary airway intervention (5). The NAEMSP further recommended that agencies who perform ETI also equip EMS clinicians with SGAs and ensure adequate training. This recommendation was supported by multiple randomized controlled trials demonstrating better outcomes and faster processes of care with SGA over ETI in out-of-hospital cardiac arrest (2,6).

While ETI allows for secure airway management, one of the largest case control studies using the National Emergency Medical Services Information Systems (NEMSIS) database demonstrated overall low success rates of 77% (7). However, the current NAEMSP position statement highlights the significant lack of data regarding SGAs (5).

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Little is known about paramedic perceptions of field airway management, including the placement and use of SGAs. Previous qualitative studies have demonstrated a sense of pride and importance in ETI amongst paramedics, with SGA placement perceived as one step along the pathway to intubation rather than definitive management in itself (8,9). However, few of these qualitative studies evaluated paramedic perception of the i-gel®, discussed significant difference in cognitive load of SGA placement versus ETI, or reported preference of on strategy over another (10).

As EMS systems around the country expand inclusion of SGAs in paramedic protocols, it is critical to understand real-world success rates of field SGA placement and their associated complications. Perhaps even more importantly, paramedic perceptions of these devices will impact their use. We evaluated i-gel® use in a large EMS system to determine frequency of successful placement, frequency of complications, and paramedic perceptions of the device performance.

Methods

We analyzed aggregate data that were prospectively collected during a 4-month pilot project conducted by the Los Angeles (LA) County EMS Agency in 2021 to determine the feasibility of i-gel® implementation in paramedic protocols. Our study was reviewed by The Lundquist Institute Institutional Review Board and was determined not to meet the human health services definition of "human subjects" research.

Setting

The LA County EMS Agency provides medical oversight and establishes treatment protocols for all EMS Provider Agencies operating within the county. The 9-1-1 EMS response is provided by 29 municipal fire departments and one law enforcement agency, with basic and advanced life support (ALS) units. Patients with paramedic primary impressions of respiratory- and cardiac-related complaints receive ALS response with dual paramedic-staffed units. For patients with hypoxia or hypoventilation, not amenable to basic airway maneuvers or those experiencing respiratory or cardiac arrest, paramedics may proceed to SGA or ETI placement per LA County EMS Agency Medical Control Guidelines (11). Paramedic scope of practice in LA County does not include rapid sequence intubation or drug assisted SGA insertion.

Pilot Design and Implementation

The LA County EMS Agency partnered with four fire-based LA County EMS Provider Agencies to determine the feasibility of i-gel® use. Together, these agencies respond to more than 300,000 9-1-1 EMS activations in LA County annually. The training period lasted from April 1st, 2021 to May 31st, 2021. The EMS Agency distributed a standardized curriculum, which consisted of an asynchronous module and live training. The training included information on the i-gel® components, indications, contraindications, procedures for use including size selection, insertion and securing the device, patient monitoring, and documentation. The in-person training materials were created and delivered by EMS physicians and nurse educators. Intersurgical® staff representatives were also in attendance to demonstrate proper use of the device, but had no other role in the data collection or analysis. Paramedics received a live demonstration of i-gel® insertion and then performed the procedure with observation of the instructor using a skills checklist. Participants also completed a written post-test.

Patients >14 years old or longer than the length-based resuscitation tape were eligible for i-gel® placement per LA County EMS protocols. Indications and contraindications for i-gel® placement mirrored existing SGA protocols for the King Laryngeal Tube (Figure 1). Additionally, the i-gel® replaced ETI as the recommended advanced airway device after return of spontaneous circulation in out-of-hospital cardiac arrest during this pilot ensuring its use, a change supported by NAEMSP Position Statement on prehospital SGAs and multiple randomized controlled trials (2,5,6). Provider Agencies were equipped with i-gel® devices size 3 through 5.

Field use of the i-gel® for the pilot project began on June 1st, 2021 and lasted through September 30th, 2021. Paramedics documented i-gel® placement in the electronic Patient Care Record (ePCR) along with standard care provided. Following each use, paramedics completed a web-based data collection form and were also instructed to call the on-call study EMS physician to confirm the accuracy and completeness of the submitted data; if unable to reach the on-call physician, paramedics were still able submit the data directly.

Data Collection

The data collection form was the primary source of data for this analysis. Variables extracted included patient demographics (age, sex), paramedic primary impression, number of i-gel® attempts, successful placement, perceived ease of placement, perceived ease of ventilation, and complications during and after placement (regurgitation/emesis during or after placement, bleeding/trauma in the oropharynx during or after placement, hypoxia during or after placement, dislodgement defined as loss of ability to ventilate after previous successful placement). A placement attempt was defined as any insertion of the i-gel® into the mouth. Successful placement was defined as the ability to ventilate the patient with minimal or no air leak and confirmed secondarily with end tidal CO_2 measurements. For patients with a successful i-gel® placement, perceived ease of placement and ventilation were measured on a one to five Likert scale with one defined as “Very Easy” and five defined as “Very Difficult”. The project team, consisting of the EMS physicians and nurse educators, also reviewed select variables available in the ePCR (paramedic impression, indication for i-gel® insertion, number of attempts, documentation of adverse events, and whether successful insertion was confirmed with capnography) to ensure accuracy and discrepancies were clarified.

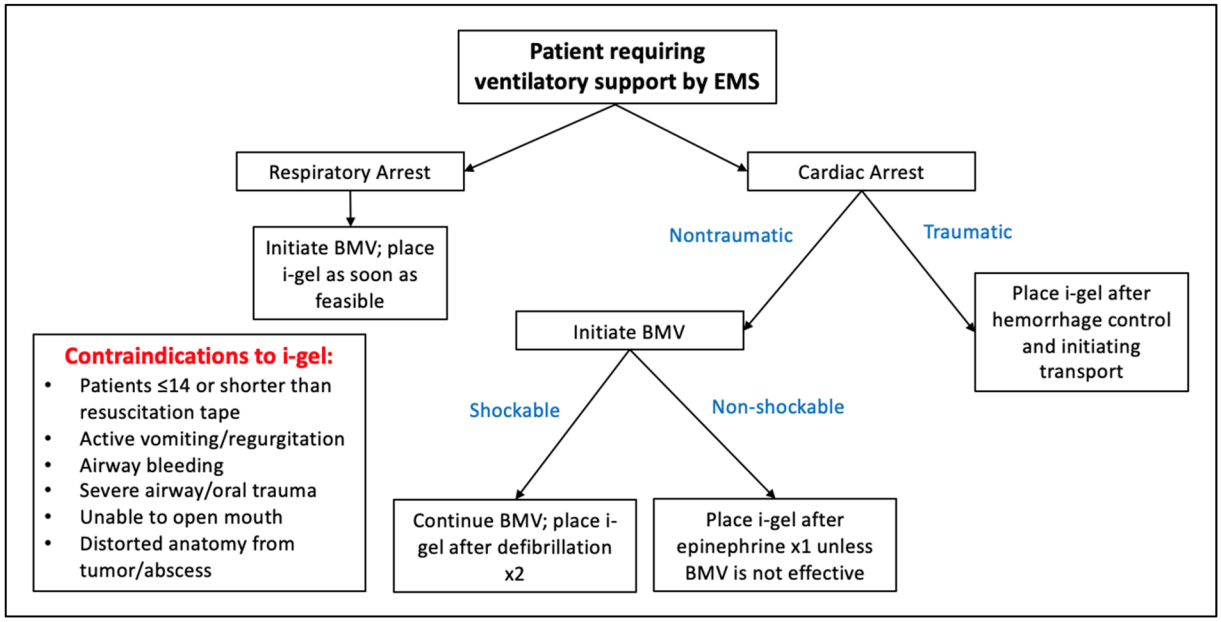

Figure 1. Protocol for i-gel® placement.
BMV = bag-mask ventilation.

Table 1. Patient characteristics ($N = 102$).

	N	%
Age (years, median)	69	IQR 53–79
Sex		
Female	54	53%
Male	48	47%
Paramedic Provider Impression		
Cardiac Arrest (Non-Traumatic)	91	89%
Cardiac Arrest (Traumatic)	4	4%
Respiratory Arrest	2	2%
Choking	1	1%
Chest Pain, Suspect Cardiac	1	1%
Overdose/Poisoning/Ingestion	1	1%
Respiratory Distress	1	1%
Traumatic Injury	1	1%

IQR = interquartile range.

Table 2. Measured outcomes ($N = 102$).

	N	%
Successful Placement	90	88%
1st Attempt Success	85	83%
Emesis/Regurgitation		
Yes	28	27%
No	71	70%
Unknown	3	3%
Bleeding/Trauma		
Yes	8	8%
No	91	89%
Unknown	8	8%
Hypoxia		
Yes	7	7%
No	51	50%
Unknown	11	11%
Hypoxia Prior	33	32%
Dislodgement		
Yes	5	5%
No	87	85%
Unknown	10	10%

Outcomes

The primary outcome was the successful placement of an i-gel® by the treating paramedic. Secondary outcomes were paramedic perceived ease of placement and ease of ventilation during use, and associated complications of i-gel® placement.

Data Analysis

We calculated descriptive statistics for baseline characteristics of patients and for primary and secondary outcomes. Continuous variables were reported as medians and interquartile ranges. Categorical variables were reported as frequencies and percentages. Data analyses were carried out in SAS 9.4 (SAS Institute, Cary, NC).

Results

Paramedics attempted i-gel® placement in 102 patients during the pilot period. The median patient age was 69 years (interquartile range 53–79) and 53% were female (Table 1). The majority of patients (89%) had a paramedic primary impression of non-traumatic cardiac arrest. Paramedics successfully placed an i-gel® in 88% of the cases, and 83% had successful placement on the first attempt (Table 2). The most common reported complication during or after placement in 27% of cases was emesis/regurgitation.

Among cases of successful i-gel® placement ($n = 90$), the majority of paramedics rated both ease of placement and ease of ventilation as "Very Easy" or "Somewhat Easy" ($n = 83$ [92%] and $n = 78$ [87%], respectively) (Figure 2). Four (4%) paramedics rated ease of placement as "Somewhat Difficult" and none rated it as "Very Difficult". One (1%) paramedic rated ease of ventilation as "Somewhat Difficult" and none rated it as "Very Difficult". Response data were missing in 2 cases for the ease of placement question and 7 cases for ease of ventilation question.

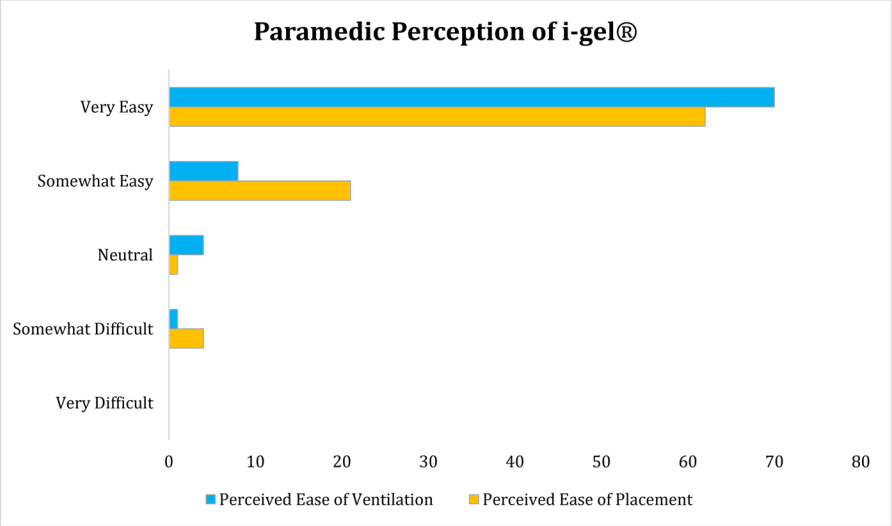

Figure 2. Paramedic perceived ease of i-gel® placement and ventilation.
There were 2 missing responses for ease of placement and 7 missing responses for ease of ventilation.

Discussion

Our study described a high rate of successful paramedic i-gel® placement during a pilot implementation project in a large EMS system. The most common indication for i-gel® was medical cardiac arrest. When paramedics who successfully placed an i-gel® were surveyed on their perception of the device, the vast majority felt that both placement and ventilation were "Very Easy" or "Somewhat Easy". Few paramedics felt that the newly implemented i-gel® device was difficult to use. To our knowledge, this is the first study to directly access paramedic perceptions of i-gel® use during civilian field care.

In our study, paramedics successfully inserted an i-gel® on the first attempt 83% of the time, which is less than the 90–94% identified in other studies (12–15). The largest of these studies comprising 1260 i-gel® insertions found a first-pass success rate of 90.6% (12). The lower first pass success could be related to the introduction of a new device into the system or related to the significant proportion of patients with reported regurgitation or emesis (27%) necessitating withdrawal to suction the airway or interfering with the ability to properly form a seal within the hypopharynx. While many of the previously noted studies did not comment on reasons for failure, one other study noted emesis rates of 18%, which frequently resulted in ETI by the EMS clinician (16). Our rates more closely approximate those seen in other SGA studies such as AIRWAYS-2 and the PART trial (2,3).

Few studies have sought to determine the paramedic perspective on use of the i-gel® as a supraglottic device. In our study, paramedics who successfully placed i-gel® rated insertion as "very easy" or "easy" 84% of the time. This supports the findings of a prior smaller study by Middleton et al., which evaluated 20 i-gel® insertions, who reported median "ease of insertion" scores for the i-gel® that were significantly lower (easier) in comparison with another SGA device (14). Similarly, Haske and colleagues found that 80% of paramedics rated i-gel® insertion during chest compressions as "easy" ($n=56$), "moderately difficult" in 16% ($n=11$), and "difficult" in 4% ($n=3$) (15).

Literature evaluating the paramedic perception of i-gel® use is sparse; our results align with a prior study in the military setting that demonstrated paramedics prefer i-gel® over other SGA (17). A qualitative study after the UK REVIVE trial found that paramedics saw the i-gel® as a useful tool in a stepwise approach toward intubation or useful to place when manpower was low, but did not specify as to why it is perceived as an easier intervention (7). We suspect this perceived ease of placement is likely multifactorial in nature. Studies have found that the i-gel® can be inserted in as fast as 14.4 s and significantly faster than other SGAs (18,19). Beyond this, i-gel® placement requires minimal education with even 45 min of education resulting in skill retention at least 3 months later (20). Finally, insertion of the i-gel® can be done with minimal interruption of compressions (15).

However, it is important to interpret these benefits in the greater context of paramedic airway management. Prioritizing the ease of SGA placement will reduce the number of intubations paramedics perform. Qualitative studies have already highlighted paramedic concerns with low frequency of ETI, minimal opportunities to practice, and skill decay (8). In the context of these concerns or possible unintended consequence of the loss of ETI in their scope, it remains unclear how paramedics may interpret the ease of SGA placement in the greater schema of prehospital airway management. To our knowledge, there has been no qualitative research directly comparing these perceptions. Future research requires prospective safety data comparing ETI to SGA, as well as studies to identify on which SGA is easiest to train and maintain skills with a focus on improved patient outcome (5).

Limitations

The results of this study should be considered in the context of certain limitations. We used previously collected prospective data from a pilot to evaluate the feasibility of i-gel® use within LA County paramedic protocols. As such, our results are strictly descriptive since we did not have a comparator group nor complete a power or sample size calculation.

Further, we evaluated process outcomes and did not include patient-centered outcomes such as survival. While we had positive results suggesting significant ease of placement and ventilation using the i-gel®, we are limited in interpreting the impact of these results in regards to the optimal method of advanced airway management.

In addition, our data are subject to some bias. They were reported by the paramedics *via* a web-based form and/or discussion with the on-call physician. Collection of data after clinical care has concluded may be subject to recall bias. We attempted to mitigate this with paramedics calls as close to the time of care as possible. Paramedics may have also been hesitant to share information about the number of i-gel® attempts and complications with the EMS Physicians. We were not able to directly confirm data such as time to insertion, reason for failed attempts, total number of attempts, or successful placement through monitor data as these data were infrequently available for review and the timing of the i-gel® insertion was not noted in most cases. We did not collect data on the frequency of specific contraindications or challenges to SGA insertion, such as anatomic distortion of the airway. Further, data were not available regarding individual paramedic years of experience with airway management.

We evaluated i-gel® use by paramedics with prior experience with the King LT, which was the SGA approved for use in LA County prior to this study. The majority of patients in our cohort were in cardiac arrest. It is possible that our results may not be broadly generalizable to other EMS systems, EMS clinicians of various levels or experience, and other patient populations.

Conclusions

In a pilot study to evaluate the feasibility to prehospital i-gel® placement in a large EMS system, paramedics were successful in 88% of attempts with the most common complication being regurgitation or emesis. Paramedics rated the ease of placement and ease of ventilation of the i-gel® device as "very easy" or "somewhat easy" in the vast majority of cases.

Authorship Statement

RD, JT, DP, DW, SK, NB, and MGH all provided substantial contributions to the design of the study and interpretation of the data. KW, JT, JW drafted the final manuscript and provided input through the revision process. All authors provided critical review of the manuscript and feedback. JN, AR, and JS were instrumental in providing education during the pilot and collecting responses. All authors provided final approval of the version to be published.

Declaration of Generative AI in Scientific Writing

The authors did not use a generative artificial intelligence (AI) tool or service to assist with preparation or editing of this work. The author(s) take full responsibility for the content of this publication.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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References

1. Wang HE, Yu MI, Crowe RP, Nassal MMJ, Gage C, Hyer JM, Powell J, Ulintz A, Sharkey-Toppen T, Wei L, et al. Longitudinal changes in emergency medical services advanced airway management. JAMA Netw Open. 2024;7(8):e2427763. doi:10.1001/jamanetworkopen.2024.27763.
2. Wang HE, Schmicker RH, Daya MR, Stephens SW, Idris AH, Carlson JN, Colella MR, Herren H, Hansen M, Richmond NJ, et al. Effect of a strategy of initial laryngeal tube insertion vs endotracheal intubation on 72-hour survival in adults with out-of-hospital cardiac arrest: a randomized clinical trial. JAMA. 2018;320(8):769–78. doi:10.1001/jama.2018.7044.
3. Benger JR, Kirby K, Black S, Brett SJ, Clout M, Lazaroo MJ, Nolan JP, Reeves BC, Robinson M, Scott LJ, et al. Effect of a strategy of a supraglottic airway device vs tracheal intubation during out-of-hospital cardiac arrest on functional outcome: the airways-2 randomized clinical trial. JAMA. 2018;320(8):779–91. doi:10.1001/jama.2018.11597.
4. Lee A-F, Chien Y-C, Lee B-C, Yang W-S, Wang Y-C, Lin H-Y, Huang EP-C, Chong K-M, Sun J-T, Huei-Ming M, et al. Effect of placement of a supraglottic airway device vs endotracheal intubation on return of spontaneous circulation in adults with out-of-hospital cardiac arrest in Taipei, Taiwan: a cluster randomized clinical trial. JAMA Netw Open. 2022;5(2):e2148871. February 1 doi:10.1001/jamanetworkopen.2021.48871.
5. Lyng JW, Baldino KT, Braude D, Fritz C, March JA, Peterson TD, Yee A. Prehospital supraglottic airways: an NAEMSP position statement and resource document. Prehosp Emerg Care. 2022;26(sup1):32–41. doi:10.1080/10903127.2021.1983680.
6. Abo BN, Hostler D, Wang HE. Does the type of out-of-hospital airway interfere with other cardiopulmonary resuscitation tasks? Resuscitation. 2007;72(2):234–9. doi:10.1016/j.resuscitation.2006.06.028(openinanewwindow).
7. Wang HE, Mann NC, Mears G, Jacobson K, Yealy DM. Out-of-hospital airway management in the United States. Resuscitation. 2011;82(4):378–85. doi:10.1016/j.resuscitation.2010.12.014.
8. Thomas JB, Abo BN, Wang HE. Paramedic perceptions of challenges in out-of-hospital endotracheal intubation. Prehosp Emerg Care. 2007;11(2):219–23. doi:10.1080/10903120701205802.
9. Brandling J, Rhys M, Thomas M, Voss S, Davies SE, Benger J. An exploration of the views of paramedics regarding airway management. Scand J Trauma Resusc Emerg Med. 2016;24(1):56. April 27 doi:10.1186/s13049-016-0243-2.
10. Prottengeier J, Petzoldt M, Jess N, Moritz A, Gall C, Schmidt J, Breuer G. The effect of a standardised source of divided attention in airway management: a randomised, crossover, interventional manikin study. Eur J Anaesthesiol. 2016;33(3):195–203. doi:10.1097/EJA.0000000000000315.
11. Ref 1300. Emergency Medical Services Agency. Available at https://dhs.lacounty.gov/emergency-medical-services-agency/home/resources-ems/prehospital-care-manual/ref-1300/. [accessed 2024 Aug 24].
12. Price P, Laurie A, Plant E, Chandra K, Pishe T, Brunt K. Comparing the first-pass success rate of the king LTS-D and the i-gel® airway devices in out-of-hospital cardiac arrest. Cureus. 2022;14(11):e30987. doi:10.7759/cureus.30987.
13. Duckett J, Fell P, Han K, Kimber C, Taylor C. Introduction of the I-gel® supraglottic airway device for prehospital airway management in a UK ambulance service. Emerg Med J. 2014;31(6):505–7. doi:10.1136/emermed-2012-202126.

14. Middleton PM, Simpson PM, Thomas RE, Bendall JC. Higher insertion success with the I-gel® supraglottic airway in out-of-hospital cardiac arrest: a randomised controlled trial. Resuscitation. 2014;85(7):893–7. doi:10.1016/j.resuscitation.2014.02.021.
15. Häske D, Schempf B, Gaier G, Niederberger C. Performance of the i-gel® during pre-hospital cardiopulmonary resuscitation. Resuscitation. 2013;84(9):1229–32. doi:10.1016/j.resuscitation.2013.04.025.
16. Voss S, Rhys M, Coates D, Greenwood R, Nolan JP, Thomas M, Benger J. How do paramedics manage the airway during out of hospital cardiac arrest? Resuscitation. 2014;85(12):1662–6. doi:10.1016/j.resuscitation.2014.09.008.
17. Schauer SG, Tapia AD, Hudson IL, Jeschke EA, Mendez J, Escandon MA, Uhaa N, April MD, De Lorenzo RA. A mixed methods end-user assessment to determine the ideal supraglottic airway device for inclusion into the medic's aid bag. J Trauma Acute Care Surg. 2022;93(2S Suppl 1):S64–S70. doi:10.1097/TA.0000000000003596.
18. Castle N, Owen R, Hann M, Naidoo R, Reeves D. Assessment of the speed and ease of insertion of three supraglottic airway devices by paramedics: a manikin study. Emerg Med J. 2010;27(11):860–3. doi:10.1136/emj.2009.084343.
19. March JA, Tassey TE, Resurreccion NB, Portela RC, Taylor SE. Comparison of The i-gel® supraglottic and king laryngotracheal airways in a simulated tactical environment. Prehosp Emerg Care. 2018;May 422(3):385–9. doi:10.1080/10903127.2017.1399183.
20. Ruetzler K, Roessler B, Potura L, Priemayr A, Robak O, Schuster E, Frass M. Performance and skill retention of intubation by paramedics using seven different airway devices – a manikin study. Resuscitation. 2011;82(5):593–7. doi:10.1016/j.resuscitation.2011.01.008.