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Original Article

First-Operator Success and Documented Complications of Laryngeal Mask Airway Insertion by Anesthesia Personnel of Mixed Experience Levels for Ophthalmic Examination and Surgery at Srinagarind Hospital: A Retrospective Cohort Study

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Abstract

Background: The laryngeal mask airway (LMA) is widely used for airway management during anesthesia for ophthalmic examinations and surgeries, yet systematic evaluation of insertion success and complications in real-world institutional settings remains limited.

Objectives: To assess the first-operator success rate and complications of LMA insertion performed by anesthesia personnel in patients undergoing anesthesia for ophthalmic examination and surgery at Srinagarind Hospital.

Methods: This retrospective cohort study reviewed records of patients who underwent elective anesthesia with LMA airway management for ophthalmic examination or surgery at Srinagarind Hospital from January 2022 to December 2024. The primary outcome was first-operator LMA insertion success (successful placement by the personnel category who made the initial attempt, without escalation to another operator), and the secondary outcome was documented LMA-related incidents. Descriptive statistics and 95% CIs (Wilson score) were calculated.

Results: A total of 531 records were analyzed (82.3% pediatric and 16.6% adult). Operator data required to determine the primary outcome were unrecorded in 70 records (13.2%); among the 461 evaluable patients, first-operator success occurred in 447 (97.0%; 95% CI, 95.0%-98.2%). First-operator success rates were 100% (134/134) among anesthesiologists, 100% (125/125) among residents, 98.2% (54/55) among nurse anesthetists, and 93.1% (134/144) among nurse anesthetist trainees. No LMA-related incident was documented in any of the 527 evaluable patients.

Conclusions: LMA insertion by anesthesia personnel of mixed experience levels achieved a high first-operator success rate, with no documented LMA-related incidents among the 527 evaluable patients. Because incidents were identified retrospectively from routine records, underreporting cannot be excluded, and differences among operator categories should be carefully interpreted. Substantial gaps in routine airway documentation indicate a need for mandatory structured recording of airway data.

Keywords: Laryngeal mask airway, Ophthalmic anesthesia, Airway management, Strabismus surgery, Retrospective study

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Introduction

Srinagarind Hospital is a tertiary-care, university-affiliated hospital accredited under the national hospital accreditation (HA) standard. Within this framework, patient safety refers to an organizational culture, processes, and technologies that reduce errors and mitigate harm from adverse events. Safe anesthesia is one of the national patient and personnel safety goals promoted under the HA framework, and the hospital's quality program monitors airway-related events as anesthesia quality indicators.[1] Therefore, reducing preventable perioperative complications is a core institutional priority, and institution-specific data on the performance and safety of commonly used airway techniques are needed to set local benchmarks, support HA reaccreditation, and target quality-improvement efforts.

Anesthesia personnel widely use laryngeal mask airway (LMA) insertion for airway management, particularly in patients undergoing anesthesia for ophthalmic examination or surgery. The device achieves a high first-attempt success rate (approximately 97%),[2,3] provides faster and generally safer airway control than tracheal intubation, and blunts the hemodynamic response and the rise in intraocular pressure associated with airway instrumentation, properties that are particularly relevant to ophthalmic procedures.[4] Comparative studies in children undergoing strabismus surgery have shown that supraglottic devices, including LMA, are associated with smaller perioperative hemodynamic and intraocular pressure changes when compared to tracheal intubation.[4]

Institutional statistics from 2022 to 2024 show a rising number of patients presenting for nonurgent, scheduled ophthalmic examinations and surgeries at Srinagarind Hospital (887, 951, and 1115 cases, respectively; Department of Anesthesiology, Srinagarind Hospital, unpublished data, 2022-2024), using a mix of airway techniques, including tracheal intubation and LMA-based general anesthesia. The LMA is a supraglottic airway device that provides more effective airway control than a facemask and is well suited to short procedures performed in the supine position with minimal intraoperative head movement, matching the requirements of most ophthalmic surgeries. However, despite its favorable safety profile, LMA use is not without complications; cough, laryngospasm, desaturation, and intraoperative displacement have all been reported, and their frequency depends on anesthetic technique, device placement duration, and operator experience.[2]

A substantial body of clinical research has examined factors that influence LMA insertion success and complications. Randomized trials have evaluated the optimal operating-table height for ProSeal-LMA insertion,[5] compared newer supraglottic devices such as the Ambu AuraGain with the LMA ProSeal in children,[6] examined the optimal timing of LMA removal with topical lidocaine to reduce airway events during emergence,[7] and compared induction agents for hemodynamic stability during LMA insertion in eye surgery.[8] Meta-analyses comparing the LMA Supreme with the i-gel and LMA ProSeal in children[9] and comparing supraglottic airway devices with tracheal intubation more broadly have shown that although postoperative sore throat rates are similar across device types, supraglottic devices are associated with a significantly lower incidence of laryngospasm, desaturation, cough, and breath-holding during emergence than tracheal intubation.[10,11] The use of muscle relaxants and the training level of the inserting personnel have also been shown to influence insertion success and complication rates.[12-14] Reported first-attempt success rates for pediatric supraglottic airway devices range from approximately 90% to 100% depending on the device used,[15] and insertion success improves as novice operators accumulate experience; in one recent learning-curve study, most novice residents reached an acceptable failure rate after a median of 15 insertions.[16]

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Airway management for ophthalmic surgery poses particular challenges. The patient's head is covered by surgical drapes and the anesthesia team is positioned away from the airway, so LMA displacement or leak may go undetected and is difficult to correct during surgery. Coughing, bucking, or movement during light anesthesia or emergence can raise intraocular pressure, cause unwanted eye movement, and disturb the surgical field; strabismus surgery is also associated with oculocardiac reflex. Compared with tracheal intubation, LMA insertion produces a smaller intraocular pressure response[17] and less coughing during emergence;[10,11] however, LMA requires adequate anesthetic depth and a reliable seal throughout the procedure.

Because most patients presenting for ophthalmic surgery at this institution are children undergoing strabismus correction, a population in which supraglottic airway devices have been shown to provide airway safety comparable to tracheal intubation, with smaller hemodynamic and intraocular pressure responses.[4,18] As contemporary outcome and safety data continue to be reported,[19] but data specific to the local practice are lacking, a systematic evaluation of LMA insertion success and complications was then undertaken. Given the increasing patient volume and the institutional goal of establishing objective, evidence-based safety standards and quality indicators, this study evaluated the first-operator success rate and complications of LMA insertion by anesthesia personnel of mixed experience levels in patients undergoing anesthesia for ophthalmic examination and surgery at Srinagarind Hospital. The findings are intended to provide local benchmark data for quality-improvement programs in the anesthesiology units and to support consistent, high-quality, safe perioperative care.

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Methods

Study Design and Setting

This retrospective, descriptive cohort study was conducted in the operating rooms of the Department of Anesthesiology at Srinagarind Hospital, Khon Kaen, Thailand, within the Faculty of Medicine, Khon Kaen University. The study protocol was approved by the institutional ethics committee for Human Research at the Faculty of Medicine, Khon Kaen University, before data collection. Individual informed consent was waived because the study used deidentified, retrospectively collected routine clinical data. Permission to access and use the anesthesia records and hospital information system data was obtained from the Director of Srinagarind Hospital before data collection.

Study Population

The study population comprised all patients who received anesthesia for elective (nonurgent, scheduled) ophthalmic examinations or surgeries at Srinagarind Hospital from 1 January 2022 to 31 December 2024, with the airway managed using an LMA inserted by anesthesia personnel.

Inclusion criteria was the patients who underwent ophthalmic examination or surgery under anesthesia with LMA airway management at Srinagarind Hospital during the study period.

Exclusion criteria were conversion of the airway plan from LMA to an alternative device (eg, endotracheal tube) after induction of anesthesia; and incomplete records, defined as anesthesia records lacking relevant data. Records with missing values for individual variables were retained, and missing values are reported as not recorded.

The minimum required sample size was calculated a priori using the formula for estimating a single proportion:[20] $n = Z^2 \times p(1 - p) / e^2$, where Z = 1.96 for 95% confidence, p = 0.5 (the most conservative assumption), and e = 0.05 (margin of error). This gave $n = (1.96)^2 \times 0.5 \times 0.5 / (0.05)^2 = 384.2 \approx 385$; after adding 10% for incomplete records (385 × 1.10), the minimum requirement was 424 patients.

Data Source and Variables

Data were extracted from the departmental perioperative anesthesia database (anesthesia record forms and the hospital's HO information system), which the anesthesia team completed for each case. Variables retrieved included sex, age, body mass index (BMI), American Society of Anesthesiologists (ASA) physical status classification, preoperative airway assessment, comorbidity presence and organ system, ophthalmic diagnosis and surgical procedure, anesthetic technique, LMA size, experience level, first-attempt operator and successful operator (ie, the anesthesia personnel category who ultimately achieved successful placement) for LMA insertion, total anesthesia duration, and any LMA-related incident, as recorded in the department's standardized incident-reporting field. Preoperative airway assessment was recorded by the attending anesthesia team on the institutional anesthesia record form in one of 5 categories including expected easy intubation, expected restricted (moderately difficult) intubation, expected difficult intubation, expected difficult ventilation, or predicted difficult ventilation and intubation. The category was assigned by clinical judgment based on the bedside airway examination, including modified Mallampati class (I-II = easy, III = restricted, IV = difficult), mouth opening, thyromental distance, neck mobility, and history of difficult airway. Experience with LMA insertion was recorded as the years of clinical anesthesia practice of the inserting personnel (< 1 year, 1-5 years, or > 5 years).

Anesthesia Personnel

Anesthesia personnel were classified into 5 categories including 1) anesthesiologists: board-certified staff anesthesiologists (Thai Board of Anesthesiology); 2) anesthesia residents: physicians enrolled in the 3-year anesthesiology residency training program, or board-certified anesthesiologists in subspecialty fellowship training; 3) nurse anesthetists: registered nurses who had completed the 1-year certificate program in nurse anesthesia and were credentialed to practice under anesthesiologist supervision; 4) nurse anesthetist trainees: registered nurses enrolled in the 1-year certificate program in nurse anesthesia; and 5) fifth-year medical students in their clinical years. All trainees and students performed LMA insertion under the direct supervision of an anesthesiologist or nurse anesthetist.

Outcome Definitions

The primary outcome was first-operator LMA insertion success, defined as successful placement of the LMA (ie, LMA that did not dislodge, kink, or obstruct, showed no detectable air leak, and provided adequate ventilation) by the personnel who made the first insertion attempt. Because the retrospective database recorded, for every case, the personnel category who made the first insertion attempt and the category who ultimately achieved successful placement, but not the number of insertion attempts, first-operator success was operationally defined as concordance between these 2 fields (ie, the same category of personnel who attempted first also achieved success, without handling to a different or more experienced operator). Repeated attempts by the same operator could not be

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distinguished from a single successful attempt; this outcome therefore did not represent true first-attempt success. Cases in which either field was not recorded were classified as having missing outcome data and were excluded from the calculation of the first-operator success rate, but were reported separately for transparency.

The secondary outcome was the occurrence of a documented LMA-related incident, extracted from the incident field of the departmental anesthesia record, which the anesthesia team completes at the end of every case and which records whether any adverse event related to LMA insertion occurred (eg, failed insertion, laryngospasm, desaturation, aspiration, airway trauma, or device displacement). Completion of this field is mandatory; events were reported by the attending team and were not independently verified, and events occurring after transfer to the recovery room were captured. Cases with no entry in this field were classified as having missing incident data and reported separately.

Statistical Analysis

Categorical variables are presented as counts and percentages; continuous variables are presented as mean (SD) when approximately normally distributed, or as median (IQR) when skewed. We calculated 95% CIs for proportions using the Wilson score method; when zero events were observed, we estimated the upper bound using the rule of 3 (3/n). Missing data were not imputed; analyses were based on available cases, and the number of records with missing data is reported for each variable. For the primary outcome, we performed a best-case/worst-case sensitivity analysis in which we assumed all records with missing operator data were successful or unsuccessful, respectively. Free-text variables (eg, diagnosis, procedure, and operator category) were independently reviewed against their corresponding coded fields; when coding inconsistencies were identified (eg, a numeric code for personnel category that combined 2 distinct operator groups under a single value in a subset of records), categories were rederived directly from the original free-text entries to preserve accuracy. Two investigators grouped diagnoses and surgical procedures into clinically coherent categories based on anatomical site and procedure type. All analyses were descriptive; we did not perform formal hypothesis testing or multivariable modeling given the small number of adverse outcome events. Statistical significance was defined as $P < .05$. We conducted all analyses using SPSS, version 16.0 (SPSS Inc).

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Results

A total of 531 anesthesia records met the inclusion criteria and were analyzed, exceeding the prespecified minimum sample size of 424. All patients received general anesthesia with LMA airway management for elective ophthalmic examination or surgery from January 2022 to December 2024.

Patient Characteristics

The study population was balanced by sex (52.5% female). Using a refined 7-level age classification, the cohort was predominantly pediatric (437/531, 82.3%, aged < 18 years), including 32.2% aged 1-5 years and 32.0% aged 6-10 years. It also included a substantial adult subgroup (16.6% [88/531], aged ≥ 18 years), spanning 18-45 years (9.0%), 46-65 years (5.5%), and > 65 years (2.1%) (Table 1). The median (IQR) age for the whole cohort was 7 (4-13) years. Given the wide age range, spanning infancy to 89 years, the median (IQR) should be

interpreted alongside the full categorical distribution rather than in isolation. Most patients were ASA physical status I or II (98.5% combined), with only 6 patients (1.1%) classified as ASA III and none as ASA IV.

A comorbidity was documented in 19.0% (101/531) of patients, most frequently respiratory conditions (eg, asthma, upper respiratory tract infection; 27.7% [28/101]), cardiovascular conditions (22.8% [23/101]), and hematologic and endocrine conditions (15.8% [16/101]); 2 patients (2% [2/101]) had more than one comorbidity. Strabismus and other ocular motility disorders were the leading diagnostic category (52.9% [281/531]) (Table 1).

BMI was documented in 53.1% (282/531); among those with a recorded value, the mean (SD) BMI was 18.1 (4.2) kg/m^2, and 4 patients had a BMI exceeding 30 kg/m^2. Preoperative airway assessment was not recorded in 43.9% (233/531); among those assessed, the large majority (82.2% [245/298] of assessed cases) had an expected easy intubation, while 15.4% (46/298) of the assessed cases had an expected restricted intubation (moderately difficult), and 2.3% (7/298) had an expected difficult intubation, an expected difficult ventilation, or a predicted difficulty with both.

Table 1. Demographic and Clinical Characteristics of Patients

Characteristic	No. (%)
All	531 (100.0)
Sex	
Female	279 (52.5)
Male	252 (47.5)
Age, y	
< 1	13 (2.4)
1-5	171 (32.2)
6-10	170 (32.0)
11-17	83 (15.6)
18-45	48 (9.0)
46-65	29 (5.5)
> 65	11 (2.1)
Not recorded	6 (1.1)
Pediatric (< 18 y)	437 (82.3)
Adult (≥ 18 y)	88 (16.6)
Age, median (IQR), y	7 (4-13)
BMI, mean (SD), kg/m^2 (n = 282)	18.1 (4.2)
ASA physical status	
I	361 (68.0)
II	162 (30.5)
III	6 (1.1)
Not recorded	2 (0.4)
Preoperative airway assessment	
Expected easy intubation	245 (46.1)
Expected restricted intubation (moderately difficult)	46 (8.7)
Expected difficult intubation	4 (0.8)

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Table 1. Demographic and Clinical Characteristics of Patients (Continued)	
Characteristic	**No. (%)**
Expected difficult ventilation	2 (0.4)
Predicted difficult ventilation and intubation	1 (0.2)
Not recorded	233 (43.9)
No comorbidity	430 (81.0)
Comorbidity*	101 (19.0)
Respiratory (asthma and URI)	28 (27.7)
Hematologic (anemia)	16 (15.8)
Cardiovascular (hypertension and valve disease)	23 (22.8)
Endocrine (diabetes, hyperthyroid, and hypothyroid)	16 (15.8)
Metabolic (obesity)	8 (7.9)
Infection (HIV)	7 (6.9)
Central nervous system (CVA and neuropathy)	3 (3.0)
Multiple (> 1 comorbidity)	2 (2.0)
Ophthalmic diagnosis	
Strabismus and ocular motility disorders	281 (52.9)
Eyelid, lacrimal and adnexal disorders	93 (17.5)
Cornea, lens, glaucoma and anterior segment disorders	48 (9.0)
Retina, neoplasm, intraocular and systemic conditions	15 (2.8)
Other/systemic finding recorded as diagnosis	90 (16.9)
Not recorded	4 (0.8)

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; CVA, cerebrovascular accident.

* Percentages for comorbidity categories are calculated among the 101 patients with a comorbidity; patients with conditions in more than one organ system are counted in each relevant category.

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Anesthetic and Procedural Characteristics

Inhalational general anesthesia was used in 90.6%, with balanced anesthesia (7.3%) and total intravenous anesthesia (0.6%) used less frequently. LMA size was not recorded in 43.3%. Among the recorded LMA sizes, size 2.0 was most commonly used (18.1%). Personnel experience with LMA insertion was evenly distributed across the < 1 year, 1-5 years, and > 5 years categories. Nurse anesthetist trainees performed the largest share of first insertion attempts (27.1%), followed by anesthesiologists (25.2%) and anesthesia residents (24.5%). The median (IQR) total anesthesia duration was 65 (55-80) minutes (Table 2).

Primary Outcome: First-Operator LMA Insertion Success

Operator data needed to determine the primary outcome were available for 461 of 531 patients (86.8%); the remaining 70 records (13.2%) (Table 2) lacked documentation of a first-attempt or successful-operator category and were excluded from the primary outcome calculation. Among the 461 evaluable cases, first-operator success was achieved in 447 (97.0%); in the remaining 14 cases (3.0%), successful placement was achieved by a different operator (Table 3).

In the sensitivity analysis, assuming that all 70 records with missing operator data were successful gave a first-operator success rate of 97.4%, and assuming that all were unsuccessful gave success rate of 84.2% (Table 3).

First-operator success differed across personnel categories. Among evaluable cases, success rates were 100% for anesthesiologists and anesthesia residents, 98.2% for nurse anesthetists, and 93.1% for nurse anesthetist trainees. Only 3 of the first attempts were performed by medical students, all of which eventually required successful LMA insertion by a more experienced operator (Table 3); this subgroup is too small to support any firm conclusion. Because case allocation was nonrandomized and key covariates were frequently unrecorded, these comparisons are descriptive.

Secondary Outcome: Documented LMA-Related Incidents

Incident data specific to LMA insertion were available in 99.2%. Among the 527 evaluable patients, no LMA-related incidents were documented. No airway loss, witnessed aspiration, laryngospasm, or death was documented among the included cases (Table 3).

Of the 14 patients who required escalation to a different or more experienced operator, most often from a nurse anesthetist trainee to a more senior colleague, none had subsequent documented LMA-related incidents. This observation is descriptive and does not establish the effectiveness of escalation as a safety mechanism.

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Table 2. Anesthetic and Procedural Characteristics

Characteristic	No. (%)
All	531 (100.0)
Anesthetic technique	
General anesthesia–inhalation	481 (90.6)
General anesthesia–balanced	39 (7.3)
General anesthesia–total intravenous anesthesia	3 (0.6)
Not recorded	8 (1.5)
Surgical procedure category	
Strabismus/extraocular muscle surgery	313 (58.9)
Oculoplastic and lacrimal surgery	65 (12.2)
Minor procedures/biopsy/wound care	45 (8.5)
Examination/diagnostic procedures under anesthesia	43 (8.1)
Anterior/posterior segment ocular surgery	28 (5.3)
Other	37 (7.0)
LMA size	
1.5	21 (4.0)
2.0	96 (18.1)
2.5	43 (8.1)
3.0	68 (12.8)
4.0	68 (12.8)
5.0	5 (0.9)
Not recorded	230 (43.3)
Experience of personnel, y	
< 1	164 (30.9)
1-5	132 (24.9)
> 5	173 (32.6)
Not recorded	62 (11.7)

Table 2. Anesthetic and Procedural Characteristics (Continued)	
Characteristic	**No. (%)**
Personnel performing first insertion attempt	
Nurse anesthetist trainee	144 (27.1)
Anesthesiologist	134 (25.2)
Anesthesia resident	125 (23.5)
Nurse anesthetist	55 (10.4)
Medical student	3 (0.6)
Not recorded	70 (13.2)
Total anesthesia duration, median (IQR), min	65 (55-80)

Abbreviation: LMA, laryngeal mask airway.

Table 3. First-Operator LMA Insertion Success and Documented LMA-Related Incidents		
Outcome	**No./Total No.**	**Incidence, % (95% CI)**
Primary outcome: first-operator LMA insertion success		
Successful by first operator (evaluable cases)	447/461	97.0 (95.0-98.2)
Required a different/more senior operator	14/461	3.0 (1.8-5.0)
Missing outcome data (excluded from rate above)	70/531	13.2
Sensitivity analysis: missing data assumed successful	517/531	97.4 (95.6-98.4)
Sensitivity analysis: missing data assumed unsuccessful	447/531	84.2 (80.8-87.0)
First-operator success by operator category (evaluable cases only)		
Anesthesiologist	134/134	100.0 (97.2-100.0)
Anesthesia resident	125/125	100.0 (97.0-100.0)
Nurse anesthetist	54/55	98.2 (90.4-99.7)
Nurse anesthetist trainee	134/144	93.1 (87.7-96.2)
Medical student	0/3	0.0 (0.0-56.1)
Secondary outcome: documented LMA-related incident		
No documented LMA-related incident	527/527	100.0
Any documented LMA-related incident	0/527	0.0 (0.0-0.6)
Missing incident data	4/531	0.8

Abbreviation: LMA, laryngeal mask airway.

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Discussion

In this retrospective cohort of 531 patients undergoing anesthesia for ophthalmic examination and surgery at a university-based hospital, anesthesia personnel achieved a first-operator LMA success rate of 97% among evaluable cases, and no LMA-related incidents were documented. These findings should be interpreted in light of the retrospective design.

The absence of documented events does not establish the absence of clinical events; minor or transient events (eg, brief desaturation or coughing) in particular may have been underreported. Comparative and meta-analytic studies have reported low rates of respiratory complications with supraglottic airway devices in children,[10,11,21] but because incident capture in this study was passive and not standardized, our rate cannot be directly compared with the prospectively collected data. Prospective surveillance with active, standardized incident capture is needed to establish the true complication rate at this center.

Second, the cohort was predominantly pediatric population (82.3%), consistent with the predominance of pediatric strabismus surgery at this referral center, and the findings therefore apply mainly to children undergoing elective ophthalmic procedures. The adult subgroup (16.6%) was small and was not analyzed separately.

The overall first-operator success rate observed of 97% is consistent with previously reported first-attempt LMA success rates in general surgical populations,[2,3] and with earlier reports of successful LMA placement and management in over 99% of pediatric ophthalmic and strabismus cases when the device is inserted and managed by trained anesthesia personnel.[2] However, our outcome may overestimate true first-attempt success because repeated attempts by the same operator could not be systematically identified. It also aligns with meta-analytic and randomized evidence that supraglottic airway devices, including the LMA, are associated with a lower incidence of perioperative respiratory complications, such as laryngospasm and desaturation, than tracheal intubation in children.[11,21]

First-operator success varied by personnel category, ranging from 100% among anesthesiologists and anesthesia residents to 93.1% among nurse anesthetist trainees. This descriptive pattern is consistent with the recognized learning curve for supraglottic airway insertion,[12,16] but this study was not designed to establish an independent effect of operator experience on insertion success. Case allocation was not randomized. In routine practice, nurse anesthetist trainees are typically assigned patients judged to have uncomplicated airways under direct supervision, whereas anesthesiologists and residents may take over cases with anticipated or encountered difficulty. Two opposing biases therefore apply: assigning trainees to lower-risk airways would inflate their apparent success rate, whereas early handover of difficult insertions from trainees to senior staff would lower it and raise the senior staff's rate. These data do not allow determination of the direction or magnitude of net bias, and airway-risk profiles by operator category could not be reliably compared because the airway assessment was unrecorded in 43.9% of records. Among the 14 cases that required escalation, no subsequent LMA-related incident was documented; this descriptive observation cannot establish the effectiveness of escalation as a safety mechanism.

The predominance of strabismus and other extraocular muscle surgeries (58.9% of procedures) in this cohort reflects the referral pattern of a tertiary pediatric ophthalmology service and aligns with prior series describing LMA use as a favorable alternative to tracheal intubation for this population, given its shorter operative duration, supine positioning, and minimal need for head movement.[4] The airway assessment data suggest a predominantly low-risk airway population, although they were unavailable for 43.9% of cases: among cases with documented preoperative airway assessment, 82.2% were judged to have an expected easy intubation, and only 2.3% were judged to have an expected difficult intubation, expected difficult ventilation, or both.

Several limitations should be noted. First, a substantial proportion of key variables had missing data, including preoperative airway assessment (43.9%), LMA size (43.3%), BMI (46.9%), and the operator-outcome fields required for the primary outcome (13.2%). Missingness of this magnitude is a recognized limitation of retrospective chart-based studies and may bias estimates in either direction if missingness is related to case complexity; in the worst-case sensitivity analysis, first-operator success could be as low as 84.2%. BMI (46.9%) and LMA size (43.3%) were unrecorded in a large proportion of records. Both are recognized determinants of insertion success and therefore act as unmeasured confounders in this study. In particular, the difference in first-operator success between nurse anesthetist trainees (93.1%) and anesthesiologists or residents (100%) cannot be

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attributed solely to operator skill; it may partly reflect differences in patient body habitus, device-size selection, or size mismatch, none of which could be assessed reliably. Second, the number of insertion attempts was not recorded, so first-operator success may overestimate true first-attempt success. Third, patients whose airway was converted from an LMA to another device were excluded, which may overestimate insertion success. Fourth, LMA-related incidents were identified from a self-reported field and were not independently verified, so underreporting, particularly of minor or transient events, is possible. Fifth, preoperative airway assessment categories were assigned by clinical judgment rather than a fixed scoring system. Sixth, several coded fields in the source database required cross-checking against, and in places rederivation from, the corresponding free-text entries to ensure accuracy; this iterative data-verification process (including a revision of the institutional dataset undertaken by the research team during the course of this study) improved the reliability of the reported estimates but also highlights an ongoing opportunity to strengthen structured data-entry design in the departmental database. Seventh, this was a single-center study without a comparator airway device or technique, limiting causal or comparative inference. Eighth, with zero documented LMA-related incidents, the study could not perform a multivariable analysis of risk factors for complications; a future study adequately powered to detect rare adverse events, or a multicenter design, would be needed to more precisely bound the true complication rate. Finally, because operator assignment was not randomized, the personnel-category comparisons presented here are descriptive and hypothesis-generating rather than confirmatory.

Despite these limitations, this study provides the first systematic, institution-specific description of LMA insertion success and documented complications for ophthalmic anesthesia at this center. It uses a sample that exceeded the prespecified target, spans 3 full years of clinical practice, and defines a specific, LMA-focused incident outcome. The findings provide local benchmark data for the departmental quality program and highlight specific opportunities for improvement. The high rate of missing airway-assessment, BMI, and LMA-size data indicates a systemic documentation gap. We recommend 1) mandatory structured fields with hard stops in the electronic anesthesia record for preoperative airway assessment, weight and height (BMI), LMA size, the number of insertion attempts, and the operator of each attempt; 2) a standardized definition and mandatory reporting of airway-related events; 3) periodic audit of these fields as departmental quality indicators; and 4) continued supervised training pathways for less experienced personnel.

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Conclusions

Among patients undergoing anesthesia for ophthalmic examination and surgery at Srinagarind Hospital, LMA insertion by anesthesia personnel of mixed experience levels achieved a first-operator success rate of 97%, and no LMA-related incidents were documented among 527 evaluable patients. Because we identified incidents retrospectively from routine records, we cannot exclude underreporting, and differences among operator categories should be interpreted descriptively. The high rate of missing airway-assessment, BMI, and LMA-size data indicates a systemic documentation gap; we recommend mandatory structured fields with hard stops in the electronic anesthesia record for these data, the number of insertion attempts, and the operator of each attempt, together with standardized mandatory reporting of airway-related events and periodic audits as departmental quality indicators.

Additional Information

Ethics Approval: This study received approval from the Khon Kaen University Ethics Committee for Human Research (HE681550) on 3 September 2025.

Clinical Trial Consideration: Not applicable. This is a retrospective observational study; clinical trial registration was not required.

Financial Support: No financial support was provided for this study.

Conflict of Interest: All authors declare no conflict of interest.

Declaration of AI Assistance: The authors used generative AI tools in preparing this manuscript. Claude was used for statistical analysis, drafting the manuscript text, and generating tables. Grammarly was used for language refinement, including grammar and clarity. All AI-generated content is based on real data and has been thoroughly reviewed and verified by the authors to ensure accuracy, validity, and integrity. The authors take full responsibility for the content presented.

Author Contributions:
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