Although the objective of this study is to show one aspect of the effects of the pandemic, extraordinary efforts will probably be required to recover activity in relation to the pre-COVID-19 era.

The limitations of this study are related to its retrospective nature and the application of a mathematical model that only provides a theoretical estimation of non-operated patients. In addition, other risks were not assessed, such as lost surgical opportunities in groups of patients at a higher risk, follow-up, and tests not performed.

CONCLUSIONS

The cardiovascular surgery program had a 60 % reduction in its operating capacity between March and August compared to a similar pre-COVID-19 period. The time required to clear the backlog of cases resulting from the pandemic may range from, at least, 10 to 19 months, even when implementing strategies to increase offer and postponing the resolution of patients whose condition allows surgery deferral.

REFERENCES

1. Hospital Garrahan. Licencias extraordinarias en el marco de las medidas adoptadas por el gobierno nacional. Intranet, noticias internas. 2020.
2. Althabe M, Rodríguez R, Balestrini M, Charroqui A, et al. Morbilidad en cirugía de cardiopatía congénita en un hospital público en Argentina. *Arch Argent Pediatr.* 2018; 116(1):e14-8.
3. Magliola R, Laura JP, Capelli H. Situación actual de los niños con cardiopatía congénita en Argentina. *Arch Argent Pediatr*. 2000; 98(2):130-3.
4. Jenkins KJ. Risk adjustment for congenital heart surgery: the RACHS-1 method. *Semin Thorac Cardiovasc Surg Pediatr Card Surg Annu.* 2004; 7(1):180-4.
5. Salenger R, Etchill EW, Ad N, Matthew T, et al The Surge after the Surge: Cardiac Surgery post-COVID-19. *Ann Thorac Surg*. 2020; 110(6):2020-5.
6. Villa A, Olivetti E, Capelli H. Programa Nacional de Cardiopatías Congénitas: diseño, implementación y resultados a mediano plazo. *Rev Argent Salud Publica.* 2015; 6(24):39-42.
7. Magliola RH, Althabe M, Moreno G, Lenz A, et al. Cardiopatías congénitas: Resultados quirúrgicos en un hospital público en Argentina. *Arch Cardiol Mex*. 2011; 81(3):178-82.
8. Stephens EH, Dearani JA, Guleserian KJ, Overman D, et al. COVID-19: Crisis Management in Congenital Heart Surgery. *Ann Thorac Surg*. 2020; 110(2):701-6.
9. Polo López L, Centella Hernández T, González Calle A, Bautista Hernández V, et al. Cirugía de cardiopatías congénitas en España durante el estado de alarma por COVID-19. *Cir Cardiovasc.* 2020; 27(4):137-41.
10. Protopapas E, Lo Rito M, Vida V, Sarris G, et al. Early Impact of the COVID-19 Pandemic on Congenital Heart Surgery Programs Across the World: Assessment by a Global Multi-Societal Consortium. *World J Pediatr Congenit Heart Surg*. 2020; 11(6):689-96.

Simulation of pediatric intubation using a low-cost videolaryngoscope in the setting of the COVID-19 pandemic

Daniel Rufach, M.D.[a], *Silvia Santos, M.D.*[b] *and Marcelo Terebiznik, M.D.*[a]

a. Hospital Interzonal de Agudos "Eva Perón", San Martín, Province of Buenos Aires, Argentina.
b. Hospital de Pediatría "Prof. Dr. Juan P. Garrahan", Autonomous City of Buenos Aires, Argentina.

E-mail address:
Daniel Rufach, M.D.: jrufach@intramed.net

Funding: None.

*Conflict of interes*t: None.

Received: 9-13-2020
Accepted: 2-1-2021

ABSTRACT

In patients with SARS-CoV-2 infection, endotracheal intubation is a procedure with a high risk for transmission. A videolaryngoscopy is a supplementary level of health care provider protection, but commercial videolaryngoscopes are expensive and not always available in pediatric intensive care units in Argentina. Our objective was to describe intubation practice using an infant head mannequin with a low-cost, handcrafted videolaryngoscope.

Fifteen pediatricians with no prior experience using the device participated in an intubation practice in a head mannequin with a handcrafted videolaryngoscope. The average time for the first attempt was 116.4 seconds (95 % confidence interval [CI]: 84.8-148.0) and, for the second one, 44.2 seconds (95 % CI: 27.7-60.6). Time decreased significantly for the second attempt (*p*: 0.0001). A successful intubation was achieved with the device in all attempts, and the procedure duration decreased with the second practice.

Key words: *videolaryngoscope, endotracheal intubation, simulation, COVID-19.*

http://dx.doi.org/10.5546/aap.2021.eng.270

To cite: Rufach D, Santos S, Terebiznik M. Simulation of pediatric intubation using a low-cost videolaryngoscope in the setting of the COVID-19 pandemic. *Arch Argent Pediatr* 2021;119(4):270-273.

INTRODUCTION

The new coronavirus (SARS-CoV-2) is highly infectious and exposes health care providers to a risk for transmission.[1] One of the procedures entailing a higher risk for infection is endotracheal intubation.[2] Experts recommend using maximum personal protective equipment to protect from aerosolization, in addition to implementing a rapid sequence intubation,[3] performing a videolaryngoscopy, and a simulation-based practice.[4-6]

A videolaryngoscopy is a standard technique for difficult airway management in children.[7] It has been increasingly used in the pediatric intensive care unit (PICU) although, compared to a traditional laryngoscopy, its use is very uncommon (89.5 % versus 10.5 %).[8] It is a useful device to teach intubation skills, allows to guide learning through a display on a monitor, and is relevant to patient safety and health care quality and to the training of intensivists who require to develop skills in airway management.

Commercial videolaryngoscopes are expensive, in average, ARS 370 000, so they are not available in every PICU in Argentina. Different authors have described their experiences using a low-cost, handcrafted videolaryngoscope.[9-11]

OBJECTIVES

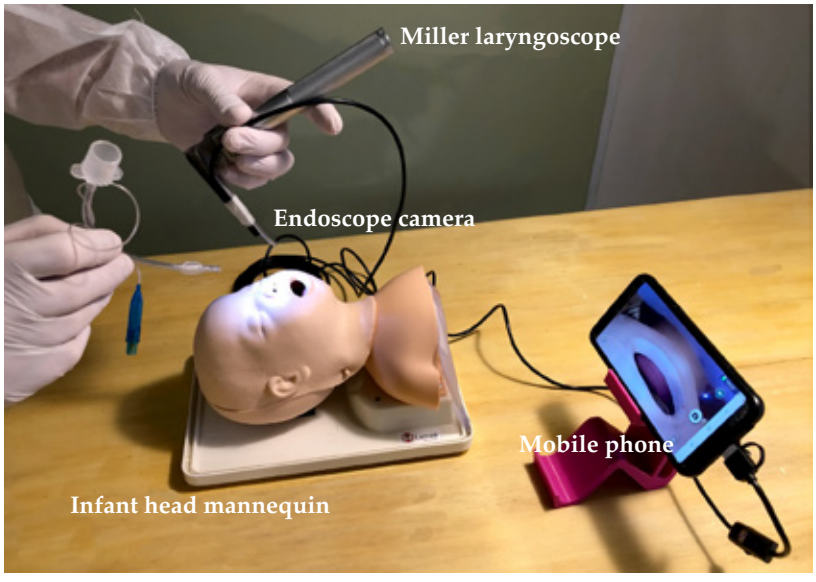
To describe intubation practice in a group of pediatricians using an infant head mannequin with a low-cost, handcrafted videolaryngoscope.

MATERIALS AND METHODS

This was a descriptive, observational study.

During June 2020, pediatricians participated in an intubation practice using a Laerdal® infant head mannequin with a handcrafted videolaryngoscope at the PICU of Hospital Interzonal General de Agudos "Eva Perón" in the province of Buenos Aires. Participants were the physicians who attended the unit Monday through Friday, and none of them had prior experience using a simulation mannequin. They received previous training with a theoretical lesson and a video tutorial conducted by the authors so that participants got familiar with the device.[12] The simulation was performed using a 7-mm endoscope camera with 6 light-emitting diodes (LEDs) for Android®; the endoscope was 2 meters long and assembled on a N° 1 straight blade of a Miller® laryngoscope. Intubation images were obtained using a mobile phone working with the Android 10® operating system and a specific endoscope software (AN98®) (*Figure 1*). A N° 3.5 endotracheal tube was used.

FIGURE 1. *Low-cost videolaryngoscope*



The simulation was done using an acrylic cube, which is used as a protection barrier in health care practice to intubate patients with the novel coronavirus disease (COVID-19).

Procedure duration and success were used as outcome measures. The mean values of both groups were compared with a t test, and a value of $p < 0.05$ was considered statistically significant. The procedure duration was measured using a stopwatch app in a mobile phone, starting at the moment the operator introduced the videolaryngoscope in the mannequin's mouth until the endotracheal tube insertion in the larynx was confirmed. The procedure was considered successful if it was confirmed that the mannequin's lungs expanded after bagging. Operators participated in the practice after signing an informed consent form.

RESULTS

Eighteen physicians participated in the simulation procedure. Data from 15 participants were analyzed because time was not measured for 3 of them. There were 7 (47 %) intensivists, 6 (40 %) pediatric residents, and 2 (13 %) pediatric intensive care residents. A total of 33 attempts were performed; all were successful (*Table 1*).

Operators completed the first intubation in an average time of 116.4 seconds (95 % confidence interval [CI]: 84.8-148.0 [43-230]). The average time for the second attempt was 44.2 seconds (95 % CI: 27.74-60.66 [16-111]). After comparing the first and second intubation attempts, time decreased significantly ($p = 0.0001$).

DISCUSSION

In the setting of the COVID-19 pandemic, health care teams need to develop new skills for their routine work. A technical skill requiring special attention is intubation in a patient with suspected or confirmed COVID-19. The guidelines developed by different anesthesia societies recommend simulations to become familiar with planned procedures and recognize any unidentified challenge. One of the focuses of learning is health care team protection when using new technological devices that require certain expertise, such as videolaryngoscopes.[13]

The advantage of a videolaryngoscopy is that increases the distance between the patient's mouth and that of the operator.[14]

In a simulation scenario, Begley et al., measured the time it took anesthesiologists to perform endotracheal intubation using a videolaryngoscope and an acrylic cube. Operators received a 5-minute training and made 2 intubation attempts before starting the simulation. Intubation using a cube lasted 82.1 seconds (95 % CI: 45.1-98.3 [30.8-180.0]) versus 42.9 seconds (95 % CI: 32.9-46.9 [30.9-57.6]) without a cube ($p = 0.002$).[15]

For the simulation described in this study, using a low-cost videolaryngoscope, the duration of the first 2 attempts were measured. The mean duration of the first intubation attempt was 34.3 seconds longer than the results obtained by Begley using commercial videolaryngoscopes; however, the second attempt duration was less than half of the first attempt.

A successful intubation was achieved with the device in all attempts, and the procedure duration decreased after the second practice.

This experience draws the attention to an expensive piece of technology that is commonly used in high income countries but that is scarcely available in countries whose economy is similar to that of Argentina. A handcrafted videolaryngoscope seems to be a good option to this problem thanks to its low cost (ARS 1900) and the fact that it can be reused.

The endoscope camera may be assembled on straight or curved laryngoscope blades. It can be cleaned as any other conventional laryngoscope.

Here we describe a simulation that helped

TABLE 1. *Health care providers participating in the simulation*

	Health care providers	Attempts	
	7 pediatric intensivists	7 intensivists: 2 attempts each	14 attempts
	6 pediatric residents	4 residents: 2 attempts each	8 attempts
		2 residents: 3 attempts each	6 attempts
	2 intensive care residents	1 resident: 2 attempts	2 attempts
		1 resident: 3 attempts	3 attempts
Total	15 health care providers		33 attempts

pediatricians become familiar with a new piece of technology that may play a role in health care team protection and patient safety.

It is not possible to generalize this experience as a recommendation about the device use because its effectiveness in the pediatric clinical setting has not been demonstrated yet.

Further research to obtain evidence about these queries is still required. ■

REFERENCES

1. The Lancet. COVID-19: Protecting health-care workers. *Lancet.* 2020; 395(10228):922.
2. Tran K, Cimon K, Severn M, Pessoa-Silva CL, et al. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. *PLoS One.* 2012; 7(4):e35797.
3. Zuo MZ, Huang YG, Ma WH, Xue ZG, et al. Expert Recommendations for Tracheal Intubation in Critically ill Patients with Noval Coronavirus Disease 2019. *Chin Med Sci J.* 2020; 35(2):105-9.
4. Orser BA. Recommendations for Endotracheal Intubation of COVID-19 Patients. *Anesth Analg.* 2020; 130(5):1109-10.
5. Cook TM, El-Boghdadly K, McGuire B, McNarry AF, et al. Consensus guidelines for managing the airway in patients with COVID-19: Guidelines from the Difficult Airway Society, the Association of Anaesthetists the Intensive Care Society, the Faculty of Intensive Care Medicine and the Royal College of Anaesthetists. *Anaesthesia*. 2020; 75(6):785-99.
6. Matava CT, Kovatsis PG, Lee JK, Castro P, et al. Pediatric Airway Management in COVID-19 Patients: Consensus Guidelines from the Society for Pediatric Anesthesia's Pediatric Difficult Intubation Collaborative and the Canadian Pediatric Anesthesia Society. *Anesth Analg.* 2020; 131(1):61-73.
7. Balaban O, Tobias JD. Videolaryngoscopy in Neonates, Infants, and Children. *Pediatr Crit Care Med*. 2017; 18(5): 477-85.
8. Grunwell JR, Kamat PP, Miksa M, Krishna A, et al. Trend and Outcomes of Video Laryngoscope Use Across PICUs. *Pediatr Crit Care Med*. 2017; 18(8):741-9.
9. Grünberg G. Intubación nasotraqueal con "videolaringoscopio artesanal" en paciente con vía aérea dificultosa prevista. *Anest Analg Reanim*. 2012; 25(2):55-60.
10. De Freitas J, Moreno J, Silva M. Prototipo de videolaringoscopio: Wi-Mac-Multivision. Rev Chil Anest 2020; 49(2):262-70.
11. Karippacheril JG, Umesh G, Ramkumar V. Inexpensive video-laryngoscopy guided intubation using a personal computer: Initial experience of a novel technique. *J Clin Monit Comput*. 2014; 28(3):261-4.
12. Simulación de Videolaringoscopía en lactante con COVID 19. [Accessed on: May 26th, 2020]. Available at: https://www.youtube.com/watch?v=7eAC6R17GuQ
13. Saito T, Taguchi A, Asai T. Videolaryngoscopy for tracheal intubation in patients with COVID-19. *Br J Anaesth.* 2020; 125(3):e284-6.
14. Hall D, Steel A, Heij R, Eley A, et al. Videolaryngoscopy increases 'mouth-to-mouth' distance compared with direct laryngoscopy. *Anaesthesia*. 2020; 75(6):822-3.
15. Begley JL, Lavery KE, Nickson CP, Brewster DJ. The aerosol box for intubation in coronavirus disease 2019 patients: an in-situ simulation crossover study. *Anaesthesia*. 2020; 75(8):1014-21.

Are electrocardiograms correctly interpreted by pediatric residents? Experience before and after an educational intervention in a teaching hospital

Georgina Bergero, M.D.[a], Melina J. Saavedra, M.D.[b], Marina Guglielmino, M.D.[a], Amanda R. Soto Pérez, M.D.[a], Julián Llera, M.D.[a] and Julio Busaniche, M.D.[a]

a. Division of Clinical Pediatrics, Department of Pediatrics.
b. Division of Pediatric Cardiology, Department of Pediatrics.
Hospital Italiano de Buenos Aires, Autonomous City of Buenos Aires. Argentina.

E-mail address:
Georgina Bergero, M.D.: bergerogeorgina@gmail.com

Funding: None.

Conflict of interest: None.

Received: 10-5-2020
Accepted: 12-17-2020

ABSTRACT

The incidence of pediatric cardiac arrest is unknown; its main etiologies are congenital heart diseases, cardiomyopathies, and ventricular arrhythmias. An electrocardiogram (ECG) is a diagnostic method that may allow to detect them in an early manner and reduce morbidity and mortality.

The objective of this study was to describe pediatric residents' skills to determine if an ECG was normal or abnormal and make an accurate electrocardiographic diagnosis before and after an educational intervention. First-year pediatric residents participated in this study. An assessment including 12 ECG tracings was done before and after an educational module, and scores were compared using the t-test for paired data.

No differences were observed between both assessments regarding the interpretation of ECG as normal or abnormal (*p*: 0.42). However, a statistically significant difference was