ORIGINAL ARTICLE

Student paramedic rapid sequence intubation in Johannesburg, South Africa: A case series

L'intubation en séquence rapide pour les étudiants auxiliaires médicaux à Johannesburg, Afrique du Sud : série de cas

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ABSTRACT

Introduction: Pre-hospital rapid sequence intubation was introduced within paramedic scope of practice in South Africa seven years ago. Since then, little data has been published on this high-risk intervention as practiced operationally or by students learning rapid sequence intubation in the pre-hospital environment. The objective of this study was to describe a series of pre-hospital rapid sequence intubation cases, including those that South African University paramedic students had participated in.
Methods: A University clinical learning database was searched for all endotracheal intubation cases involving the use of neuromuscular blockers between 1 January 2011 and 31 December 2015. Data from selected cases were extracted and analysed descriptively.
Results: Data indicated that most patients were young adult trauma victims with a dominant injury mechanism of vehicle-related accidents. The majority of cases utilised ketamine and suxamethonium, with a low rate of additional paralytic medication administration. 63% and 72% of patients received post-intubation sedation and analgesia, respectively. The overall intubation success rate from complete records was 99.6%, with a first pass success rate of 87.9%. Students were successful in 92.4% of attempts with a first-pass success rate of 85.2%. Five percent of patients experienced cardiac arrest between rapid sequence intubation and hospital arrival.
Discussion: Students demonstrated a good intubation success and first pass-success rate. However, newly qualified paramedics require strict protocols, clinical governance, and support to gain experience and perform pre-hospital rapid sequence intubation at an acceptable level in operational practice. More research is needed to understand the low rate of post-intubation paralysis, along with non-uniform administration of post-intubation sedation and analgesia, and the 5% prevalence of cardiac arrest.
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ABSTRACT

Introduction: L'intubation en séquence rapide (ISR) pré-hospitalière a été introduite dans le champ d'activité des auxiliaires médicaux en Afrique du Sud il y a sept ans. Depuis, peu de données ont été publiées sur cette intervention à haut risque telle qu'elle est pratiquée de manière opérationnelle ou par des étudiants apprenant l'ISR dans l'environnement pré-hospitalier. L'objectif de cette étude était de décrire une série de cas d'intubation en séquence rapide pré-hospitalière, y compris des cas auxquels des étudiants ambulanciers des universités sud-africaines avaient participé.
Methodes: Une base de données universitaire sur l'apprentissage clinique a été consultée afin d'identifier tous les cas d'intubation endotrachéale impliquant le recours à des inhibiteurs neuromusculaires entre le 1er janvier 2011 et le 31 décembre 2015. Les données de cas sélectionnés ont été extraites et analysées de manière descriptive.
Résultats: Les données indiquaient que la plupart des patients étaient de jeunes adultes victimes de traumatismes, le mécanisme de blessure dominant étant les accidents de la route. La majorité des cas utilisaient la kétamine et le suxaméthonium, et un faible taux d'administration de substances paralysantes.

63% et 72% des patients ont respectivement reçu une sédation post-intubation et des analgésiques. Le taux de réussite global de l'intubation à partir des archives complètes s'élevait à 99,6%, avec un taux de réussite au premier passage de 87,9%. Les étudiants réussissaient dans 92,4% de leurs tentatives, avec un taux de réussite au premier passage de 85,2%. Cinq pour cent des patients ont été victimes d'un arrêt cardiaque entre l'intubation à séquence rapide et leur arrivée à l'hôpital.

Discussion: Les étudiants ont obtenu un bon taux de réussite à l'intubation et un bon taux de réussite au premier passage. Cependant, les auxiliaires médicaux jeunes diplômés ont besoin de protocoles strictes, d'une gestion clinique et de soutien pour acquérir de l'expérience et réaliser des intubations à séquence rapide pré-hospitalières à un niveau acceptable dans la pratique opérationnelle. Des études supplémentaires sont nécessaires pour comprendre le faible taux de paralysie post-intubation, parallèlement à l'administration non uniforme de la sédation et des analgésiques post-intubation, ainsi que la prévalence d'arrêt cardiaque de 5%.

African relevance

- This study describes pre-hospital rapid sequence intubation cases in an urban, middle income setting.
- Pre-hospital rapid sequence intubation could improve airway management in populations with a high prevalence of trauma.
- This study highlights the role of student experience in pre-hospital rapid sequence intubation success rates.

Introduction

Airway management forms a critically important part of the skill set of paramedics. This includes both basic airway interventions and, at advanced life support level, more invasive forms of airway management. In many systems, endotracheal intubation (ETI) is practiced by advanced life support paramedics, frequently in the form of drug-assisted ETI with deep sedation using a benzodiazepine, other hypnotic agent, or rapid sequence intubation (RSI) [1].

In South Africa, RSI was approved for pre-hospital practice by the Emergency Medical Services (EMS) regulator, the Health Professions Council of South Africa, in November 2009. Prior to this, several different levels of advanced life support-qualified paramedics could only perform ETI facilitated by deep sedation with midazolam. The Health Professions Council of South Africa approved pre-hospital RSI only for University degree-qualified paramedics known as Emergency Care Practitioners (ECPs) and subject to a number of requirements, the most important of which was practice of RSI within a system of on-going case review and clinical governance.

Since the addition of RSI to ECP scope of practice seven years ago, little data has emerged about the practice of RSI by ECPs in South Africa [2]. Importantly, no data is currently available describing the practice of RSI by ECP students. This is true of RSI and ETI performed by paramedic students globally, with very little having been published in this area [3,4]. Although qualified and experienced paramedics are responsible for the delivery of emergency care in EMS systems, students represent the next generation of care provision and understanding of their clinical experiences is important in optimising the clinical learning environment.

This study aimed to describe a series of pre-hospital RSI cases involving student ECP participation over a five-year period.

Methods

This study was a retrospective record review of RSI cases performed by students in the Department of Emergency Medical Care at the University of Johannesburg between 1 January 2011 and 31 December 2015.

Data described in this study were collected by students during clinical learning. All students are required to complete a required number of pre-hospital clinical learning hours. During this time, students are also required to complete a specified number of clinical procedures. Students complete clinical learning in a number of different private and local authority EMS systems in and around Johannesburg, including the Department, which runs a primary response vehicle three days a week. Each case is documented as part of a clinical patient care record with the RSI reporting section of the record having been adapted from the National Association of EMS Physicians Recommended Guidelines for Uniform Reporting of Data from Out-of-hospital Airway Management [5]. All patient care records are entered by students into a custom-developed online patient care record database before the paper records are submitted to the Department.

Students first perform ETI in their second year of study during clinical learning in the operating room under the supervision of an anaesthesiologist. This is preceded by theoretical instruction, ETI practice, and documentation of procedural competence in a clinical simulation facility. Second year students are required to complete a minimum of 15 operating room ETIs. After having successfully completed theoretical and procedural assessment on pre-hospital RSI, third year students may participate in RSI cases during clinical learning under supervision. These students are required to perform a minimum of eight pre-hospital ETIs, three of which must be RSIs. Fourth year students are required to complete a further minimum of eight ETIs, all of which must be RSIs. Over the course of the four-year programme, a student would therefore typically be required to complete 35 ETIs, 11 of them RSIs.

A standardised approach to RSI is learned by students early in their third year of study. The emergency airway management text by Kovacs and Law [6] is prescribed for all students from second year, and students learn the RSI algorithm in this text. Drugs available for induction, paralysis, and post-intubation sedation and analgesia are those approved for pre-hospital RSI by the Health Professions Council of South Africa.

All records where ETI was performed pre-hospital that documented the use of a neuromuscular blocker (suxamethonium or rocuronium) between 1 January 2011 and 31 December 2015 were included. RSI cases identified using the criteria above were excluded from full analysis if any part of the RSI-related patient care record required for this analysis was incomplete. This included data on clinical parameters (systolic blood pressure, SpO_2, and heart rate) and $ETCO_2$ data. Only records with unambiguous $ETCO_2$ data (clearly indicating elevated or unelevated $ETCO_2$ levels or a peak $ETCO_2$ value) were included. Records indicating that $ETCO_2$ was used for verification of ETI success, without further details, were excluded. Duplicated records were excluded from analysis.