



## SYSTEMATIC REVIEW

# Wristbands use to identify adult patients with difficult airway: a scoping review



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### KEYWORDS

Airway management;  
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### Abstract

**Background:** Difficult airway is a clinical situation in which a trained anesthesiologist experiences trouble with facemask ventilation and/or laryngoscopy and/or intubation. Poor identification of at-risk patients has been identified as one of the causes of difficult airway management.

**Objectives:** We aimed to review the literature regarding the use of wristbands to identify adult patients with known or predicted difficult airway in hospitals.

**Methods:** We searched Web of Science (WoS), Scopus, MEDLINE and OVID following the stages described by the PRISMA Extension for Scoping Reviews (PRISMA-ScR). We used a combination of MeSH terms and non-controlled vocabulary regarding the use of difficult airway wristbands in adults. Three researchers independently reviewed the full texts and selected the papers to be included based on the inclusion criteria.

**Results:** Our search generated 334 articles after removing duplicates. After reviewing full text articles, only seven studies were included. Here we found that most were from the United States, in which the authors report the use of in-patients' wristbands in adults. According to the authors, the use of wristbands is being implemented as a measure of improved quality and safety of in-patients with difficult airway either known or suspected.

**Conclusions:** The identification with wristbands of a difficult airway at an appropriate time is an identification strategy can have a low cost but a high impact on morbidity. It is pertinent to develop a methodology such as the use of wristbands, that allows a good classification and identification of patients with difficult airway in hospitals from Latin America.

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## Introduction

One of the leading causes of anesthesia-related injury is the failure to intubate the trachea and secure the airway.<sup>1</sup> The American Society of Anesthesiologists (ASA) published in 1993 an initial practice guideline for difficult airway management to prevent the adverse outcomes associated, such as brain damage, myocardial injury, and death.<sup>2,3</sup> The term “difficult airway” is used for a clinical situation in which a trained anesthesiologist experiences trouble with facemask ventilation and/or laryngoscopy and/or intubation.<sup>4–6</sup> Difficult intubation has been reported with an incidence of 0.5% up to 10% in patients undergoing general anesthesia depending of used parameters.<sup>7</sup> As this fact varies across studies, there are no standardized definitions for difficult airway in the emergency department setting, where the incidence of the difficult airway has been described as wide as 2% to 27%.<sup>8</sup>

Risk factors related to difficult airway scenario include poor identification of at-risk patients, poor or incomplete planning, inadequate provision of skilled staff and equipment,<sup>9</sup> delayed recognition of events,<sup>10</sup> and failed rescue due to failure in interpreting the capnography.<sup>11</sup> As difficult airway is, unfortunately, an ever-present hazard in anesthetic practice, some recommendations have been suggested to better management of this issue, including the establishment of a structured difficult airway/intubation registry linked to a highly visible coded patient wristband for in-hospital identification of such patients.<sup>12</sup>

The use of visible wristbands for subjects with different risk conditions have been proven important and a safe way for identification by all the medical staff that works at a hospital and have contact with them.<sup>12–15</sup> This alert tool could be vital for a patient with difficult airway and should be employed widely by the hospitals. In this context, the purpose of this study is to review the literature regarding the use of wristbands to identify adult patients with known or predicted difficult airway in hospitals.

## Methodology

### Protocol and registration

This scoping review was based on the stages described by the PRISMA Extension for Scoping Reviews (PRISMA-ScR).<sup>16</sup> The protocol was registered at the Open Science Framework database.<sup>17</sup>

### Eligibility criteria

Original studies that implemented the use of in-hospital wristbands for the identification of adult patients with difficult airway were eligible for this scoping review.

### Information sources and search

The structured searching for relevant papers at Web of Science (WoS), Scopus, MEDLINE, and OVID used a combination of MeSH terms and non-controlled vocabulary that we considered crucial to our objective, in the equation:

(( TITLE-ABS-KEY ( äirway control) OR TITLE-ABS-KEY ( äirway management) OR TITLE-ABS-KEY ( äifficult airway) OR TITLE-ABS-KEY ( äirway) ))

AND

(( TITLE-ABS-KEY ( wristband ) OR TITLE-ABS-KEY ( bracelet ) OR TITLE-ABS-KEY ( bracelet identification) OR TITLE-ABS-KEY ( bracelet medical information) OR TITLE-ABS-KEY ( bracelet hospital) OR TITLE-ABS-KEY ( alert bracelet) ))

Only for the OVID search we also included in the equation the term “Patient identification system”. All searches were made without language or time restrictions until July 2020. To control publication bias, we also conducted a generic and academic Internet search and a metasearch. A search strategy defined for “gray literature” was included to gather information from the source Google Scholar, with the non-controlled terms “wristbands”, “bracelets”, and “difficult airway”.

## Data charting process and data extraction

We included studies describing in-hospital factors associated with unexpected difficult airway events and possible strategies to assertive identification of these subjects. Three individuals (EL, FA, GMG) independently examined the titles and abstracts identified in the search. Articles considered as relevant were selected and downloaded for full-text review. Three researchers (EL, FA, GMG) independently reviewed the full texts and selected the papers to be included in the scoping review based on the inclusion criteria. With the studies finally selected, the same researchers extracted the data. Disagreements were resolved by consensus.

## Synthesis of results

The variables of abstraction included: author, year of the study, country, journal, study design, and wristband applicability. A data extraction table was built in Microsoft Excel to organize the results.

## Results

A systematic search of scientific evidence in Web of Science (WoS), Scopus, MEDLINE, OVID, and Google scholar yielded 334 results after duplicates were removed. Of these, the abstracts and titles were screened, and 301 citations excluded. Thirty articles were retrieved and reviewed in full-text, and after applying the inclusion/exclusion criteria, 23 articles were further excluded. The resulting seven studies were used for the qualitative analyses (Fig. 1). Main characteristics and information of the selected papers are summarized in Table 1. The studies found ranged from 1992 to 2017, and most of them were from hospitals in the United States. Most studies were retrospective reviews, and only one case report. The use of wristbands is being implemented in hospitals as a measure of improve quality and safety of patients with difficult airway. According to the studies, these wristbands should be of a bright color such as green or blue to enhance visibility, and patients must keep it throughout the hospitalization.

**Table 1** Characteristics and main information of articles included in this review.

Author/Year	Country	Journal	Study type	Wristband applicability
Atkins et al. 2017	United States	The Joint Commission Journal on Quality and Patient Safety	Retrospective review	The creation of a difficult airway identification (DAID) bracelet arose from a safety-focused improvement
Berkow et al. 2009	United States	Anesthesia & Analgesia	Retrospective review	Since 1996, in-patients who were known to have a difficult airway had a green alert band attached next to their patient identification band. This alert band stayed with the patient throughout the hospitalization.
Barron et al. 2003	United Kingdom	Anaesthesia	Cross-sectional study	According to the questionnaires, only 4% of the UK anaesthetic departments responded that used warning bracelets issued whilst the patient is in the hospital as a method of documentation and communication of airway problems.
Baker et al. 2013	New Zealand	Anaesthesia and Intensive Care	Survey and retrospective analysis	After the documentation of a difficult airway in a patient, identification devices such as wristbands and alert stickers in the notes, among others are being used.
Darby et al. 2016	United States	Journal of Intensive Care Medicine	Retrospective review	Difficult airway wristband alerts were implemented since 2011 as a quality improvement intervention
Mark et al. 2015	United States	Anesthesia & Analgesia	Retrospective descriptive analysis	Each patient identified as having a difficult airway is given a blue wristband to immediately activate the Difficult Airway Response Team (DART) should their airway become compromised.
Mark et al. 1992	United States	Journal of Clinical Anesthesia	Case report	Patients identified as having a difficult airway/intubation were entered into an ongoing "Anesthesia-Medical Alert" investigation that involved immediate application of a temporary patient wristband and enrollment in an in-house registry. The high visibility of the wristband and its information alerted health care providers to the special requirements of the patients for the duration of their hospitalization.

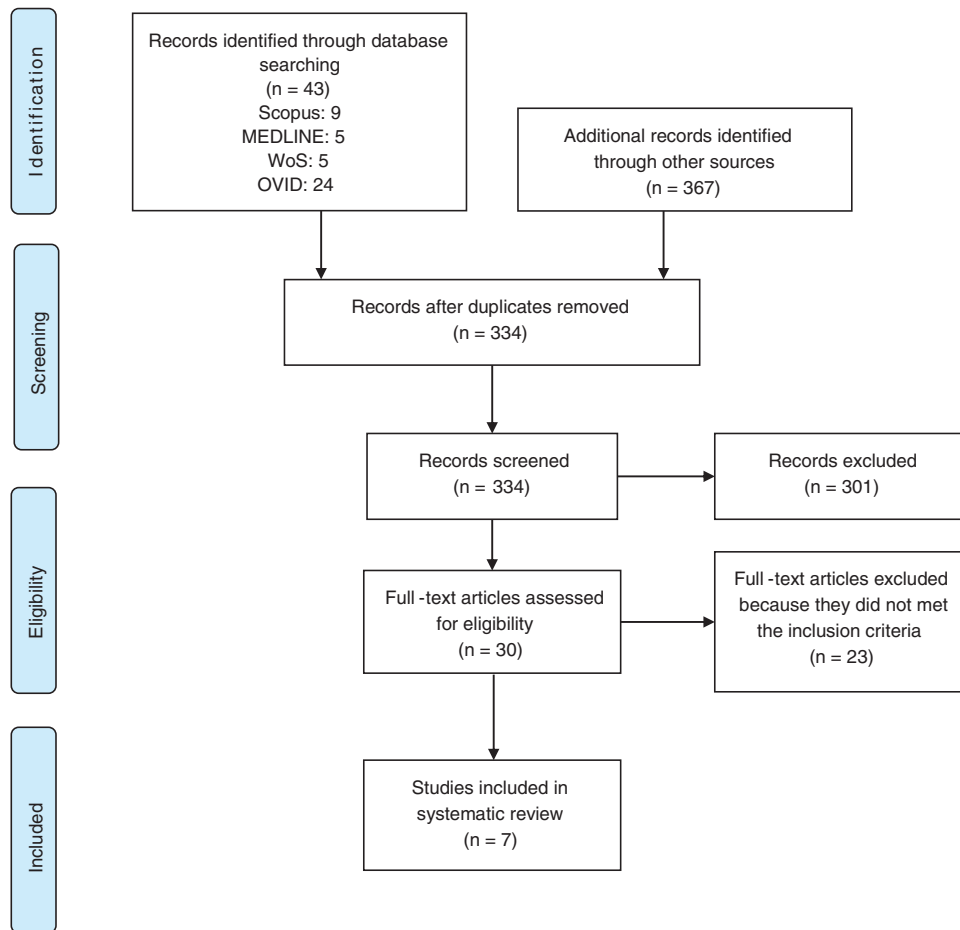


Figure 1 PRISMA Flow diagram.

## Discussion

With this study we aimed to review the literature regarding the use of wristbands to identify adult patients with known or predicted difficult airway in hospitals. Here we found seven original studies, most from the United States, in which the authors report the use of in-patients' wristbands in adults. According to the authors, the use of wristbands is being implemented as a measure of improved quality and safety of in-patients with difficult airway either known or suspected.

### Identification of patient with difficult airway

In emergency settings, identification of anticipated difficult airway is a crucial step to achieve first-pass success and avoid encountering a "cannot intubate, cannot ventilate" situation. The level of difficult intubation depends on the degree of glottic view with laryngoscopy. Cormack and Lehane (C-L) classification system is the most widely used scale to categorize the degree of visualization of larynx by direct laryngoscopy. The C-L grades 3 and 4 are highly correlated with difficult or failed intubations. However, as identification of the C-L grade needs to insert the laryngoscopy, clinicians should estimate the probability of

problems before attempting the intubation.<sup>7,8</sup> Even after using multiple clinical screening tests, a significant incidence of unanticipated difficult laryngoscopy (1%–8%) has been observed.<sup>18</sup> The identification for individuals with previous high C-L grades or difficult/impossible access to airway by visual reminders would be of relevance to healthcare personal and multidisciplinary teams in order to remind the seriousness of this condition and force them to consider a structured plan if troubles are present. There are different tests that can be combined to achieve a better airway management in the patient. The Mallampati classification is one of the most used and is based on the structures identified when seated patients have maximal mouth opening and tongue protrusion.<sup>3</sup> Computed tomography and magnetic resonance imaging are also helpful to measure the internal diameter of the trachea and to identify disease processes such as trauma, infection, and neoplasm.<sup>3,19</sup> Ultrasound and plain radiographs are used too, the latter can be useful to demonstrate tracheal compression or deviation and to indicate the need for more investigation and imaging.<sup>3,19,20</sup>

Difficult airway in a patient is most likely to be evident in an operating room, nonetheless, subsequent events might occur in different places and involve physician or nonphysician providers. Hence, anesthesiologist or any healthcare provider should make every effort to identify patients with difficult airway both in and out of the operating room, and

effectively communicate this information widely, making it accessible, using universal and easy-to-understand terms to advise other health professionals, family members, or the patients themselves about the condition.<sup>21</sup>

### The use of wristbands in hospitals

When difficult airway has been recognized, medical staff should document specific details for which templates for this purpose have been previously published.<sup>22</sup> Measures such as wristbands and patient identification emblems/bracelets and alert cards, such as that provided by the New Zealand Society of Anaesthetists in a tertiary referral hospital, have been employed according to Baker et al.<sup>23</sup> Difficult airway information must be shared openly so that future potential problems are avoided.<sup>22</sup> One of the best ways to share this information is to develop an international alert system that allows health care providers to have instant access to the conditions of a patient, even if the patient have to be transferred to a health care institute in another city or country.<sup>23</sup>

Hoffmeister and De Moura<sup>15</sup> did a quantitative study to check the presence of identification wristbands and identifiers used in a hospital from Brazil. They found that out of 385 patients, 95.8% of the patients used the wristbands, while the remaining did not use them because they did not think it was important. The identifiers used on the wristbands were mainly the full name and the registration number. The authors found that some patients used anti-allergic micropore covering the internal section of the wristbands to avoid an allergic reaction to the material.

On the other hand, according to the Health ministry in Colombia, the use of wristbands is essential for the correct identification of the patients and its absence is classified as an active failure that can lead to major adverse events.<sup>24</sup> Their recommendation when the bands are depleted is to use any other method to identify the patients such as cards with the patient's information. Nevertheless, a unified classification system should be developed nationwide, not only in Colombia but also in other Latin-American countries that lack of a proper in-hospital identification system for their difficult airway patients, which is evident given the absence of publications regarding this matter.

In the retrospective review of Atkins et al.<sup>25</sup> at the Hospital of the University of Pennsylvania, the authors report the implementation of a Difficult Airway ID system since 2006, in which the medical staff place a wristband on the patient with documented difficult airway or anticipated difficult airway while they are in the hospital. This system, according to the authors, is along the lines of a model described by Berkow et al.<sup>26</sup> Regarding the use of wristbands, Berkow et al.,<sup>26</sup> report that since 1996, in-patients with known difficult airway wore throughout their hospitalization time, a green alert band attached to their identification band. Moreover, Darby et al.,<sup>27</sup> developed at the University of Pittsburgh Medical Center Presbyterian Hospital, a Difficult Airway Management Team since 2005, which involved since 2011 the use of difficult airway wristband alerts as a quality improvement intervention. Mark et al.<sup>12</sup> in 1992 and Mark et al.<sup>28</sup> in 2015 report the application of a temporary patient wristband with high visibility at the Johns Hopkins Hospital in Baltimore, Maryland. In their study from 2015, the

authors explained the use of a blue wristband in patients with known difficult airway as a measure included in their Difficult Airway Response Team (DART) program developed in 2005.

Recently, a new proposal has arose regarding the identification of patients with difficult airway called "The DAS Airway Alert Card and Difficult Airway Database Project". This project aims to address this issue by providing a simple and easy reporting system that promise not only to make it easy to report but also ensures availability of this information full-time. This is a remarkable effort to unify the health issues of patients, specifically regarding the difficult airway, in a national database. However, this project is only for the United Kingdom.

### Limitations

The main limitation of our study was the few number of original articles found in the search, we believe this might be due to the lack of documentation of wristband use in patients with difficult airway rather than a reflection of low use of this strategy.

### Conclusions

The identification of a difficult airway with wristbands at an appropriate time is a strategy can have low cost but high impact on morbidity. Here we found that the use of wristbands is being implemented as a measure to improve quality and safety of in-patients with difficult airway either known or suspected in developed countries. However, we did not find studies from Latin-American countries, which lead us to believe that it is pertinent to develop a methodology such as the use of wristbands, that allows a good classification and identification of patients with difficult airway in hospitals from Latin America.

Moreover, it would be a good improvement in quality the establishment of a coding color for the wristbands within hospitals nationwide, as well as improving the quality of the material used for the wristbands, making sure that the ink used for inscriptions on the wristbands do not wash off easily. It would also be important to consider that some patients may be allergic to the material of the wristbands, and they should be made with anti-allergic materials. In addition, we believe that it may be important to consider the development of an application or database of universal consultation, with its identification number of patients with difficult airway.

### Conflicts of interest

The authors declare no conflicts of interest.

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