

## EVALUATING NEAR-DROWNING AND DROWNING VICTIMS

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**SETTINGS:** Rio de Janeiro Fire Department - Near-Drowning Recuperation Center, Copacabana  
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### EDITOR'S NOTE

One of the most difficult medical decisions a lifeguard must make is how to treat a victim who is believed to have aspirated (inhaled) water. Should an ambulance be summoned? Should the victim simply be kept under observation? Can the victim be released without further care?

Dr. David Szpilman, a medical doctor who works with professional lifeguards in Rio de Janeiro and serves as President of the Brazilian Lifesaving Society (SOBRASA), has developed a classification system to assist lifeguards, ambulance personnel, and doctors in cases such as these. The system was recently detailed in an article published in the medical journal *Chest* (September 1997). It is reprinted here in an abbreviated form.

### INTRODUCTION

The coastline of Brazil is 4,445 miles long, the longest in South America. Its warm climate encourages a beach-going culture year round. In 1995, 7,020 people are known to have died due to drowning in Brazil.

The Brazilian city of Rio de Janeiro has a rescue service responsible for safety along 60 miles of beaches, with 2 lifeguards every 550 yards and specialized medical teams in 2 different care centers. These care centers, called Near-Drowning Recuperation Centers (NDRC), are located immediately adjacent to the beaches.

The duty of medical personnel at the NDRCs is to render specialized medical assistance to near-drowning and drowning (ND/D) patients. Patients stay at an NDRC until their condition is stabilized. At that point, the patient may be referred to a hospital, kept for further observation at the NDRC, or released.

The uniquely focused responsibilities of medical personnel at the NDRCs has resulted in an unusual degree of expertise in handling drowning and near-drowning victims. Their experience in

this area of medicine goes well beyond that of most emergency room physicians, who may treat ND/D only occasionally.

Doctors at the NDRCs sought a method for determining the chances of survival of these patients based on symptoms presented, as well as a method to determine the best treatment protocols based on patient status. In 1972, two Brazilian doctors, Menezes and Costa, developed a classification system to separate cases of ND/D into 4 grades of severity. The study reported here was conducted to evaluate this system and update it.

## **MATERIAL and METHODS**

We reviewed 41,279 cases of predominantly seawater rescues, utilizing rescue reports recorded by beach lifeguards, from January 1972 to December 1991. Of these cases, 2,304 (5.5%) were referred to the NDRC during the study period because they had been diagnosed as ND/D requiring medical attention. The remaining 38,975 cases did not require further medical care and were released directly from the site of the aquatic accident after lifeguards had completed a rescue report.

The medical aid report completed at the NDRC describes what happened prior to the physician's arrival based on a detailed report compiled by the lifeguard responsible for first aid, as well as the subsequent medical treatment. Further data was compiled until the patient was discharged from the NDRC or died. In addition, the records of patients referred to a hospital were reviewed.

**At a minimum, we define a near-drowning case as a case in which the victim is coughing, indicating that water has been aspirated.** More serious findings, such as foam about the nose and mouth, difficulty or absence of breathing, or cardiac arrest resulting from an aquatic accident, also indicate ND/D. A case was considered a ND/D case if any of those findings were present **when the patient was first evaluated by a lifeguard.** A case was classified as a simple rescue (without near-drowning) if none of those findings were present.

All ND/D cases received immediate care on the beach by lifeguards and referral to a physician from NDRC. The physician was contacted by the lifeguard via radio immediately after the water rescue had taken place and near-drowning was diagnosed.

## **RESULTS**

Of 2,304 cases of ND/D referred to the NDRC because they required medical assistance, 92.6% were rescued from the water by lifeguards and 7.4% by bathers present at the accident site

(these include fresh water cases brought from other areas). Of those seawater ND/D patients 90% were transported to NDRC by ambulance and the rest (10%) arrived in private cars or by helicopter. Although lifeguards were not present at all rescues, they were always present during subsequent first aid, except in cases of ND/D in fresh water.

Of the 2,304 cases, the reports on 1,831 of the cases were adequately thorough to be used in the study. All 1,831 cases were at least initially treated at the NDRC, but 187 patients required transfer to a hospital. Of the entire study group treated at an NDRC, 89.4% survived and 10.6% died.

## CONCLUSION

The study concluded that instead of 4 grades of severity for ND/D victims, there are actually 6 grades which can be defined based on initial signs and symptoms of the victims and the decision as to whether they will need advanced medical treatment. These 6 grades constitute the basis of a new classification system, which can easily be applied by lifeguards.

Of the 38,975 cases studied, it was found that if the victims showed none of the signs and symptoms discussed in Grade 1 – 6, there were no later medical complications. Therefore, cases without any of these symptoms can be classified as simple rescues and the victims released at the scene.

**NOTE:** Once the classification of a particular case has been determined upon the initial evaluation of the victim by a lifeguard, it should not be changed during the recovery period or hospitalization.

**Grade 1** - patients who aspirate a small amount of water, sufficient to provoke irritation of the upper airways causing ***cough without foam in mouth/nose***. Treatments include rest, warming and calming the victim (this can be done on the beach or hospital). This grade does not normally require transport to a hospital.

**Grade 2** - patients who aspirate a moderate amount of water causing ***a small amount of foam in mouth/nose***. Treatment requires up to 5 liters of oxygen per minute (by nasal cannula) to restore normal arterial oxygenation, as well as the procedures for Grade 1. These patients require observation in a hospital from 6 to 24 hours.

**Grades 3 and 4** patients who have aspirated a great amount of water with ***a large amount of foam in mouth/nose*** generally need high flow (15 liters) oxygen by facial mask and advanced

cardiac life support (ACLS). In both cases, hospitalization is required. Grades 3 and 4 are differentiated from each other by:

**Grade 3 - *great amount of foam in mouth/nose with radial pulse present*** (without low blood pressure).

**Grade 4 - *great amount of foam in mouth/nose without radial pulse*** (low blood pressure). Oxygen administration may ameliorate low blood pressure, but usually this grade needs intravenous (I.V.) infusion of fluids to restore adequate blood pressure (ACLS).

**Grade 5 - *respiratory arrest*** (no breathing) *without cardiac arrest*. Cardiac arrest will occur quickly, varying from seconds to 2 or 3 minutes, if mouth-to-mouth is not applied immediately at the scene (even during rescue in water). High flow (15 liters) oxygen after resuscitation should be used. Hospitalization is always required.

**Grade 6 - *cardiopulmonary arrest*** (CPA). Treatment is immediate application of CPR with supplemental oxygen. Hospitalization is always required.

Tables 1 and 2 show the outcome for each of the victims considered as part of the study. Based on this study, a chart of recommended procedures for dealing with ND/D victims has been developed. It can be easily applied by lifeguards on the beach to determine the best method for treating ND/D patients and can be found in Figure 1.

It is important to remember that treatment must be provided in a manner that is appropriate to the lifeguard's level of medical training and in accordance with local medical protocols. While this study was extremely thorough and has been published in a major medical journal (Chest), the procedures outlined have not been universally accepted at present. Lifeguards should consult with their local medical authorities and provide them with a full copy of the Chest article for evaluation.

The author wishes to acknowledge the assistance of Chief B. Chris Brewster in editing this article for lifeguards.

***AUTHOR'S REPRINT REQUEST:*** For a full copy of the original article (which is significantly more detailed), you may write or fax the author Dr. David Szpilman at: Av. das Américas 3555, bloco II, sala 302 - Barra da Tijuca - Rio de Janeiro - RJ - Brazil - CEP: 22631-004 - Telephone: 055 (021) 4900192, Phonefax: 4307168, e.mail <szpilman@ccard.com.br>

The original article, along with many others, was republished in the proceedings of the International Life Saving Federation Medical Rescue Conference, which can be purchased by

sending a check for \$20, made out to ILS to: B. Chris Brewster, 2581 Quivira Court, San Diego, CA 92109.

**Table 1: CLASSIFICATION AND DEATH RATE\* (n = 1831)**

Grade	Number(n)	Death Rate
1	1189	0 (0.0%)
2	338	2 (0.6%)
3	58	3 (5.2%)
4	36	7 (19.4%)
5	25	11 (44%)
6	185	172 (93%)
<b>P &lt; 0.0001</b>		

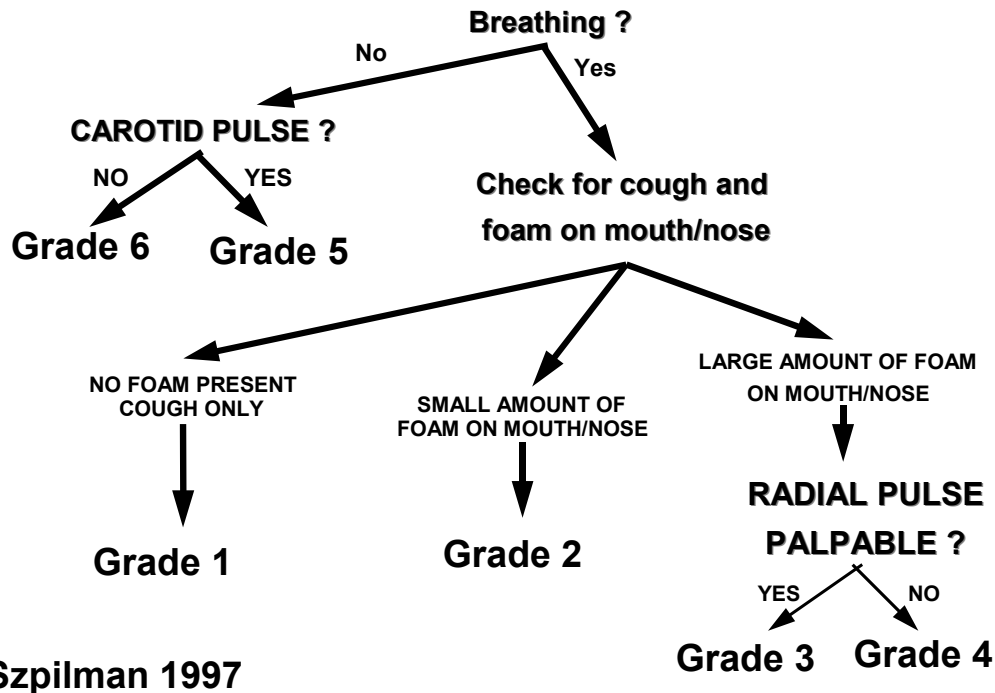
\*Overall death rate was 10.6%.

**Table 2: NEED FOR HOSPITALIZATION AND MORTALITY (n=187)**

Grade	Taken to Hospital	Deaths
1	35 – 2.9%	0 – 0.0%
2	50 – 14.8%	2 – 4.0%
3	26 – 44.8%	3 – 11.5%
4	32 – 88.9%	7 – 19.4%
5	21 – 84%*	7 – 33.3%
6	23 – 12.4%*	10 – 43.5%
<b>Total</b>	<b>187 – 10.2%</b>	<b>29 – 15.5%</b>

**Note:** Mortality in the hospital was 15.5%; \*Four patients grade 5 and 162 grade 6, out of this table, were pronounced dead and thus taken directly to the morgue.

## NEAR-DROWNING AND DROWNING CLASSIFICATION



GRADE	SIGNS AND SYMPTOMS	FIRST AID
<b>Rescue</b>	<b>No coughing, foam, difficulty breathing, or cardiac arrest</b>	1. evaluate and release from the accident site without further medical care as appropriate
<b>1</b>	<b>cough, without foam in mouth/nose</b>	2. rest, warm and calm the victim; 3. advanced medical attention or oxygen administration should not normally be required
<b>2</b>	<b>small amount of foam in mouth/nose</b>	4. oxygen - 5 liters/min (by nasal cannula); 5. rest, warm and calm the victim; 6. hospital observation from 6 to 24 hours.
<b>3</b>	<b>large amount of foam in mouth/nose with palpable radial pulse</b>	7. 15 liters/min of oxygen by facial mask; 8. advanced cardiac life support (ACLS); 9. hospitalization required.
<b>4</b>	<b>large amount of foam in mouth/nose, without palpable radial pulse</b>	10. 15 liters/min of oxygen by facial mask; 11. monitor breathing; 12. advanced cardiac life support (ACLS) immediately for mechanical ventilation and I.V. fluid infusion; 13. hospitalization (ICU) required.
<b>5</b>	<b>respiratory arrest, without cardiac arrest.</b>	14. mouth-to-mouth immediately at the scene; 15. hospitalization (ICU) required.
<b>6</b>	<b>cardiopulmonary arrest</b>	16. apply CPR immediately; 17. hospitalization (ICU) required.

**Notes:** 1. Once the ND/D classification has been determined, it should not be changed during the recovery period; 2. On sloping beaches all ND/D victims should be positioned face-up, with their body parallel to the waterline, with the lifeguard's back to the water (so as to facilitate CPR maneuvers without falling over the victim); 3. Don't use techniques to try to drain the water from lungs as this can increase the occurrence of vomiting; 4. In general, CPR is carried out in all cardiac arrest cases when the exact duration of the submersion is not known, or when such time is certainly less than 1 hour.