

What we can learn from 12,741 Medics...

Ed Racht, MD
Chief Medical Officer
AMR Medicine
Rehabilitated Eagle



3,000,000 Patient encounters
a year

38 States

12,742 Medics

88 Medical Directors

Approx 27,300 Cardiac
Arrests / year

10,422,356 Patient records

1 Harley-Davidson Test Track

1 Harley-Davidson Test Track

10,422,356 Patient records



THE IMPACT OF CPAP ON PHYSIOLOGIC IMPROVEMENT

RAPS (no, Paul...)

The Rapid Acute Physiology Score

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The Rapid Acute Physiology Score (RAPS) was developed and tested for use as a severity scale in critical care transports. RAPS is an abbreviated version of the Acute Physiology and Chronic Health Evaluation (APACHE-II) using only parameters routinely available on all transported patients (i.e. pulse, blood pressure, respiratory rate, and Glasgow Coma Scale). RAPS has a range from 0 (normal) to 16. Two hundred eighty-three patients were transported by helicopter; 82 died. Pretransport RAPS was available on 282 of 283 patients (mean, 3.6; median, 3). Because of death, discharge, or transfer, 227 complete APACHE-II scores using least physiologic values for the first 24 hours after transfer were collected (mean, 14.9; median, 13). Stepwise logistic regression showed that when all APACHE-II and RAPS values were available, the best single predictor of mortality was worst value APACHE-II ($\chi^2 = 57.0$, $P < .01$). When pretransport RAPS was considered as a single explanatory variable, it too had significant predictive power for mortality ($\chi^2 = 92.53$, $P < .01$). Correlation analysis comparing RAPS with APACHE-II values at similar points in time revealed a significant relationship in all cases, with the highest correlation between RAPS worst values and APACHE-II worst values ($r = .8172$, $P < .01$). It was concluded that RAPS can be applied usefully in complement with APACHE-II and may have limited utility when used alone. (*Am J Emerg Med* 1987; 5:278-286)

Severity scales have been used for both clinical evaluation of patients and system-wide assessment. Two areas in which clinical scoring methods have been applied are cardiopulmonary resuscitation, where significant factors have been identified that permit stratification of patients into risk groups,¹⁻³ and trauma care, where severity scales have been used widely for system evaluation and triage.^{4,5} The care of critically ill patients who must be transported either to

or between hospitals might be similarly improved by the use of severity scoring. Because there is no widely accepted severity score that can be applied rapidly to almost all critical care transports, a simplified version of the Acute Physiology and Chronic Health Evaluation (APACHE-II)⁶ score was developed. The usefulness of this score, the Rapid Acute Physiology Score (RAPS), was evaluated using a group of helicopter-transported patients.

METHODS

The Rapid Acute Physiology Score was developed by taking those elements of APACHE-II that can be obtained reliably on all patients in the field or in a hospital emergency department. These elements consist of pulse, blood pressure, respiratory rate, and Glasgow Coma Scale (GCS).⁷ Point values for these factors were identical to APACHE-II except for GCS points, which were scored as follows: GCS = 14-15/RAPS = 0, GCS = 11-13/RAPS = 1, GCS = 8-10/RAPS = 2, GCS = 5-7/RAPS = 3, GCS = 3-4/RAPS = 4 (Tables 1 and 2). Two thirds of the points for APACHE-II are laboratory generated and therefore not included. Because RAPS has only about one third the potential sum of APACHE-II, the GCS contribution to RAPS was decreased by two thirds to keep its proportional contribution similar for the two scores. The possible RAPS range is 0 (normal) to 16.

Adult patients (older than 10 years) returning to the University Medical Center (UMC) by helicopter were assigned RAPS using information obtained before transfer, on arrival at UMC, following one day of hospitalization, and using worst values (least physiologic values) obtained during the first 24 hours at UMC. APACHE-II scores also were calculated at these times when possible.

If the patient had any missing values he or she was excluded from analysis with the following exceptions: 1) If creatinine was not available but BUN was normal, creatinine was assumed to be normal. 2) If arterial blood gas testing was not performed because the patient's clinical condition did not indicate the need for this measurement, arterial blood gases were assumed to be normal.

The power of APACHE-II and RAPS to predict mortality was assessed using stepwise logistic regression. This model assumes that $\ln[\text{Pr}(\text{survival})/\text{Pr}(\text{death})]$ is linear in the explanatory variables. The model fit the data reasonably well and allowed a predicted survival curve to be generated. Because we were interested also in the relationship between

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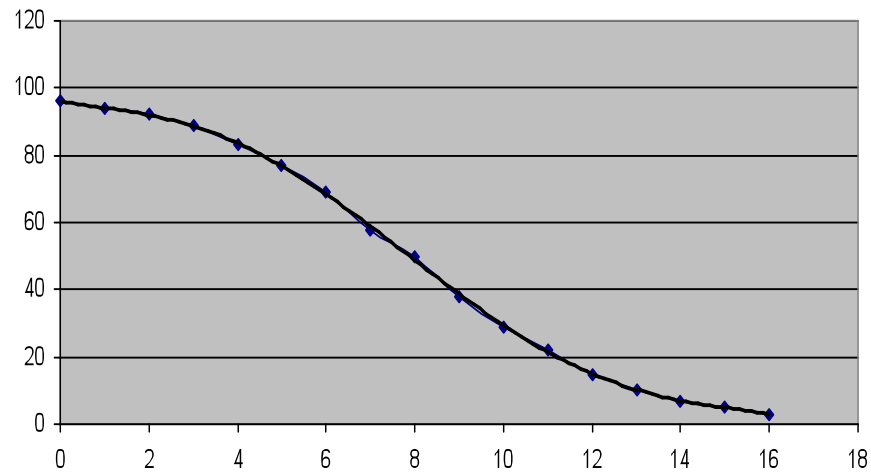
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Key Words: Acute Physiology and Chronic Health Evaluation, critical care transport, helicopter, Rapid Acute Physiology Score, severity scale.

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Based on Rhee's Work

$$y = 0.0000x^6 - 0.0009x^5 + 0.0304x^4 - 0.3320x^3 + 0.7168x^2 - 2.3529x + 95.9946$$
$$R^2 = 0.9998$$



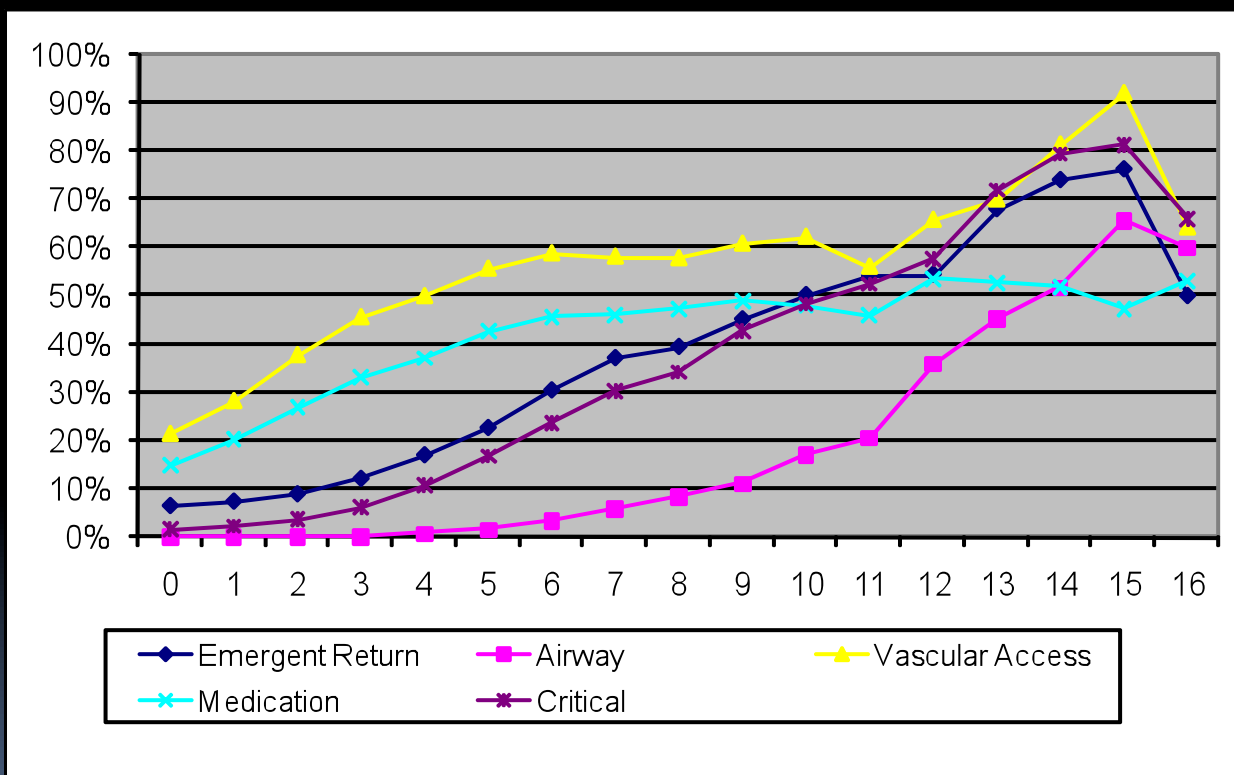
RAPS	Survival %
0	96
1	94
2	92
3	89
4	83
5	77
6	69
7	58
8	50
9	38
10	29
11	22
12	15
13	10
14	7
15	5
16	3

Utility of RAPS/REMS

Author/Year	Sample	Conclusion
Rhee/1987	283 helicopter transports	RAPS correlates well with APACHE
Rhee/1990	1,868 helicopter transports	RAPS is a reliable predictor of mortality. <i>...for a given patient condition in the field, an improvement during transport in RAPS will be reflected in a decreased probability of mortality.</i>
Olsson/2004 (Sweden)	12,006 ED patients	REMS > RAPS predicting hospital mortality & length of stay (but RAPS wasn't bad)
Goodacre/2006 (England)	5,583 ED patients arriving via ambulance	REMS > RAPS predicting hospital mortality (but RAPS wasn't bad)

Emergent procedure / returns by RAPS

2006-2008



The Impact of CPAP on Physiologic Improvement

- 60,894 Records met inclusion
- 1311 (2.2%) received CPAP
 - CPAP mean age higher (71.7 vs 66.1)
 - CPAP Init O₂ Sat lower (85% vs 91%)
 - No difference in initial ETCO₂

The Impact of CPAP on Physiologic Improvement

- Advanced airway use more likely in NCPAP patients (5.0% vs 1.1%)
- CPAP patients more likely to receive medications (66.4% vs 51.1%)
- Statistically (but not clinically) significant increased scene time with CPAP

The Impact of CPAP on Physiologic Improvement

- 52.4% of CPAP patients experienced improvement in RAPS
- 37.3% of NCPAP patients improved
- RAPS improvement > 3
 - CPAP – 20.1%
 - NCPAP – 12.0%

The Impact of CPAP on Physiologic Improvement

In a subgroup analysis 31% of non CPAP patients who were intubated deteriorated, as compared to 15% of patients who received CPAP without intubation.

The use of CPAP in the acute out-of-hospital setting improves defined physiologic parameters and decreases intubation rates.

If Ray Fowler had kids...



Thanks...

