



US006682481B2

(12) **United States Patent**  
**McKinley et al.**

(10) **Patent No.:** **US 6,682,481 B2**  
(45) **Date of Patent:** **Jan. 27, 2004**

(54) **RESUSCITATION FROM SHOCK**

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/165,184**

(22) Filed: **Jun. 7, 2002**

(65) **Prior Publication Data**

US 2003/0226568 A1 Dec. 11, 2003

(51) **Int. Cl.**<sup>7</sup> ..... **A61B 5/00**; A61M 31/00

(52) **U.S. Cl.** ..... **600/301**; 128/898; 604/507

(58) **Field of Search** ..... 600/301; 128/898;  
604/507

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,291,692 A	9/1981	Bowman et al.	604/31
4,839,822 A	6/1989	Dormond et al.	706/45
5,023,785 A	6/1991	Adrion et al.	600/300
5,055,447 A *	10/1991	Palladino et al.	514/12
5,330,505 A	7/1994	Cohen	607/6
5,405,362 A	4/1995	Kramer et al.	607/5
5,694,950 A	12/1997	McMichael	128/898
6,148,814 A	11/2000	Clemmer et al.	128/220.24

**OTHER PUBLICATIONS**

Clemmer et al., "Developing and gaining acceptance for patient care protocols," *New Horizons* 6(1):12-19, 1998.  
McKinley et al., "Blunt trauma resuscitation: The old can respond," *Archives of Surgery* 135:688-695, 2000.

McKinley et al., "Computer Directed Resuscitation Of Major Torso Trauma," *24<sup>th</sup> Annual Conference On Shock*, Marco Island Fl, Jun. 9-12, 2001. Shock 15(Supplement):46, abstract # 137, 2000.

McKinley et al., "Nitroprusside in resuscitation of major torso trauma," *Journal of Trauma: Injury, Infection and Critical Care*, 49(6):1089-1095, 2000.

McKinley et al., "Tissue hemoglobin oxygen saturation during resuscitation of traumatic shock monitored using NIR spectrometry," *Journal of Trauma: Injury, Infection and Critical Care*, 48(4):637-642, 2000.

Morris, "Algorithm based decision making," *In Principles and Practice of Intensive Care Monitoring*, Tobin (ed.), New York: McGraw-Hill, pp. 1355-1381, 1997.

Sauaia et al., "Early risk factors for postinjury multiple organ failure," *World J Surg*, 20:392-400, 1996.

Sauaia et al., "Multiple organ failure can be predicted as early as 12 hours postinjury," *J Trauma*, 45:291-303, 1998.

The Electrical Engineering Handbook, CRC Press, Richard C. Dorf et al. eds., 1993.

Van Nostrand's Scientific Encyclopedia, 8th ed., Van Nostrand Reinhold, Douglas M. Considine et al. eds., 1995.

Kalia et al, *Surgery in General*, Mar. 16, 2001 ch 1 available at <http://www.oup.co.uk/pdf/0-19-262703-1.pdf>.\*

Tegtmeier, Shock, Oct. 16, 1998 available at <http://www.peds.umn.edu/divisions/pccm/teaching/acp/shk/shock.html#treat>.\*

\* cited by examiner

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(57) **ABSTRACT**

Methods, software, and apparatuses are described for resuscitation of shock due to trauma and/or hemorrhage. A representative embodiment involves a method of treating shock in a patient. A plurality of data elements representative of a condition of the patient are acquired, and shock in the patient is treated by following a step-by-step goal directed, data driven protocol, which references the plurality of data elements. The fixed protocol may be implemented in software or otherwise.

**47 Claims, 14 Drawing Sheets**

