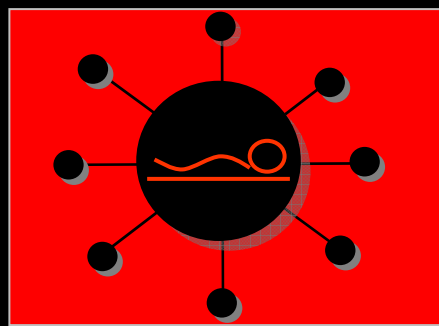


STaRRT

SHOCK TEAM and RAPID RESPONSE TEAM

AN INTEGRATED
SYSTEM OF CARE
FOR PATIENTS AT RISK



SHOCK TEAM and RAPID RESPONSE SYSTEM

Preface

The Shock Team and Rapid Response Team (STaRRT) Program evolved from a community hospital Rapid Response System for early recognition and rapid treatment of patients in shock. This system was able to significantly reduce mortality for patients with non-traumatic shock and has expanded into a full Rapid Response System (RRS). The STaRRT Program combines the conventional forms of shock with hypoxic shock (i.e., primary respiratory insufficiency and acute change in neurologic status) directing care to the highest risk patients thus demonstrating benefit quickly, fostering adoption and reducing cost per life saved.

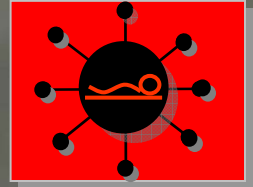
RRSs started with code blue teams using ACLS therapy. This approach evolved into organized early intervention systems i.e., trauma, acute myocardial infarction, stroke, and most recently medical emergency teams (MET). A MET is a group of physicians and nurses activated by non-physician clinicians to quickly evaluate and treat patients with clinical deterioration. Initial reports showed this approach promising in reduction of in hospital cardiac arrests and mortality. However, a recent multicenter, cluster-randomized trial showed no significant change in the incidence of cardiac arrest, unplanned ICU admissions or unexpected death. Potential limitation of the MET approach include failure to change clinicians' behavior, limited effect of the MET team due to lack of standardized therapy, and the application to patients with a wide range of illness severity that might mask improvement in high-risk groups. In addition, the six months duration of the intervention phase in the latest trial may not have provided enough time to adequately educate clinicians on early recognition, activation criteria and initial treatment to change hospital culture. Shock Team and Rapid Response System (STaRRS) described in the manual achieves its' mortality reduction through a more focused deployment, directed at the highest risk patients (i.e. non-traumatic shock) with early recognition and rapid application of best practice goal-directed protocols. It emphasizes the importance to recognize that education, implementation and quality improvement activities of a RRS are an ongoing process and frequent feedback to the staff on outcomes is essential to effect change.

This manual is designed to be a RRS turn-key education and implementation package for a variety of clinical settings. Its flexible design provides tools for either nurse or physician led MET, different levels of team activation tailoring the response to patient acuity, best matching resources with need. The Ten Signs of Vitality (10SOV) and STaRRT educational programs empower frontline providers to recognize critical illness earlier, rapidly initiate best practice resuscitation protocols while mobilizing intuitional resources and becomes the foundation for development and implementation of a RRS.

The electronic format provided on the enclosed CD containing the Ten Signs of Vitality and STaRRT programs allow you to modify materials as outlined in the table of contents to meet your facility's needs. The DVDs contain lectures by Frank Sebat, MS, MD, FCCP, FCCM a critical care practitioner and member of the Society of Critical Care Medicine Task Force on Rapid Response Teams and Sue Henderson, MSN, NP, CCRN, Critical Care Educator at Fremont-Rideout Health Group and co-developer of the 10 SOV and STaRRT. These programs along with their examinations can be used as an instructional tool for your educator and/or students at your site .

A growing number of hospitals are currently implementing this curriculum for nurses and other clinicians as a baseline competency and an educational program for implementation of a RRS.

STaRRRT



AN INTEGRATED SYSTEM OF CARE FOR PATIENTS AT RISK

Preface
Forward

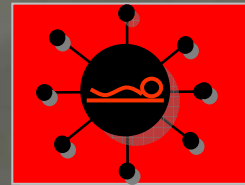
- I. Introduction
 - a. Background and Need
 - b. Rapid Response System Overview
 - c. Published Results of STaRRRT
 - d. Types of Critical Illness Quickly Leading to Rapid Deterioration
 - e. Cycle of Critical Illness

- II. Key Elements of a Rapid Response System
 - a. System components
 - b. Type of Rapid Response Systems
 - c. Activation Criteria
 - d. Team
 - e. Interventions
 - f. QI and Administration (Sue's stuff)

- III. Education
 - a. Inclusion Criteria and Protocol Posters
 - b. Education Lectures on DVD
 - c. PowerPoint Presentation & RN & Physician Exams on CD
 - i. Ten Signs of Vitality (10 SOV)
 - ii. STaRRRT
 - iii. Simulations / Case Studies

- IV. Implementation and Procedures
 - a. Design Team
 - b. Inclusion Criteria
 - c. Type of Rapid Response System
 - d. Barriers and Methods to Overcome Barriers
 - e. Critical Illness Flow Diagram and Treatment
 - f. Program Implementation Costs
 - g. Implementation Time Line
 - h. STaRRRT Alert Procedure Level 1
 - i. STaRRRT Alert Procedure Level 1, 2 & 3
 - j. STaRRRT LAB / Cart & Equipment
 - k. Protocol Flip Cards for STaRRRT Cart
 - l. Yellow Staff Card with Inclusion Criteria to be worn with ID Badge

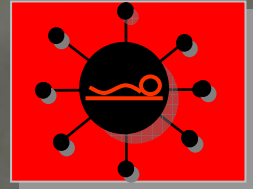
STaRRT



- V. Protocols
 - a. Prehospital
 - b. Referral or Outlying ER
 - c. Receiving Hospital ER
 - d. Intermediate Care & Med Surg
 - e. Hypoxic Shock (Acute Change in Neurologic Status and Primary Respiratory Failure)
 - f. Hypovolemic Shock
 - g. Septic / Spinal / Anaphylactic / Shock (Distributive Shock)
 - h. Cardiogenic / Obstructive Shock
 - i. Coagulation Factor Replacement
 - j. Fluid Challenge (CVP)
 - k. Fluid Challenge (PA)
 - l. Antibiotic
 - m. Pressor
 - n. Dysrhythmia
 - o. Insulin
 - p. Pain / Sedation
 - q. Potassium / Magnesium Phosphorus
 - r. Low Tidal Ventilation
 - s. Ventilator Weaning

- VI. Physician Order Sets
 - a. Initial STaRRT and Hypovolemic Shock Admission Orders
 - b. Acute Deterioration in Neurologic Status
 - c. Primary Respiratory Failure
 - d. Septic Shock
 - e. Cardiogenic Shock: Non Acute MI
 - f. Anaphylactic Shock
 - g. Coagulation Replacement
 - h. Dysrhythmia
 - i. Amiodarone
 - j. Insulin Infusion
 - k. Weight-Based Heparin
 - l. Eptifibatide (Integrilin)
 - m. Drotrecogin Alfa Activated Xigris
 - n. Sedation and pain
 - o. Comfort pathway
 - p. Transfer orders
 - q. Pain Management with Spontaneous Respirations
 - r. Sedation for Ventilated Patients
 - s. Total Parenteral Nutrition

STaRRT



VII. Tools

STaRRT Alert Packet- The following items will be placed in a yellow 8x10 envelope that is attached to the Shock Cart. They will be implemented as soon as a "STaRRT Alert" is called:

- a. Yellow Sticker for Front of Patient's Chart to Identify Patient Who Had STaRRT Alert with Applied Inclusion Criteria
- b. Data Collection Tool
- c. Physician Order Sets
 - i. Initial
 - ii. Acute Change in Neuro Status and Primary Respirator Failure
 - iii. Septic / Anaphylactic
 - iv. Hypovolemic
 - v. Cardiogenic
- d. Multidisciplinary Goal Form

VIII. Data Collection

- a. Data Collection
- b. Power Analysis
- c. Poster: Is Your Patient Critically Ill or At High Risk for Becoming Critically Ill?
- d. Yellow Sticker for Front of Patient's Chart to Identify Patient Who Had STaRRT Alert and Criteria Met
- e. Data Collection Tool
- f. APACHE II Score Form

BACKGROUND AND NEED

Recognition and treatment of critical illness and non-traumatic shock is often delayed or inadequate.⁽¹⁾
²⁾ This is due to insufficient knowledge of frontline health care professionals to recognize various forms of critical illness including shock early, lack of empowerment to start therapy independently, limited intensive care unit (ICU) /hospital resources and lack of an institution-wide system to facilitate best-practice treatment of patients in shock.⁽¹⁻⁵⁾ The therapeutic arsenal for severe sepsis and shock has grown in the last decade with the use of drotrecogin alpha, low dose steroids and early goal-directed resuscitation for severe sepsis.⁽⁶⁻⁸⁾ Unfortunately, therapeutic advances often do not quickly translate into benefits at the bedside.⁽⁹⁻¹⁴⁾ The lag time between availability of proven therapies and their adoption by physicians can be attributed to inability to keep abreast of expanding medical literature and resistance to change due to ingrained patterns of behavior.⁽¹¹⁾ Lack of institutional systems that facilitate adoption of new best practice therapies may also contribute to this delay.

Further delay is compounded in the community setting by 24-hour in-house physician coverage generally available only through the emergency department. Significant alterations in vital signs or neurologic status in the field or hospital necessitate a call to and a response from the emergency department, primary physician or consultant, delaying assessment and treatment. In the academic setting, response from 'clinicians in training,' is often delayed due to lack of experience or education in recognition and treatment critical illness early.

Shock is a syndrome of inadequate tissue perfusion. If it is not recognized and treated during a narrow window of opportunity, critical tissue hypoxia develops and initiates a cascade of events leading to multi-organ failure and death.^{3, 4} The estimated mortality in cardiogenic shock with acute myocardial infarction ranges from 50-80%.⁵ In septic shock, mortality varies from 28 to 50 %. Even with major advances in the therapeutic armamentarium, septic shock alone has been estimated to claim 90,000 lives per year in the United States.^{7, 8} Hypoxic shock due to primary respiratory failure or deteriorating neurologic status quickly leads to cardiovascular decomposition and arrest. Despite its high incidence and mortality, a comprehensive systems-based approach to rapidly identify and treat shock has been slow to evolve

A hospital-wide program that educates clinicians to identify early and treat rapidly life-threatening conditions, a team response focused on the highest risk patients, and treatment protocols based upon best practice guidelines may improve outcomes. This approach has been successful in cardiac arrest, trauma and rapid response teams, where non-physician personnel identify patients, initiate frontline therapy and mobilize institutional resources. Patients in shock are a significant group at-risk who have benefit from a similar approach with demonstrated decrease time to interventions and mortality yearly over five years

This manual is designed to assist in implementation of a rapid response system with the above elements at your institution and evaluate its effect.

RAPID RESPONSE SYSTEM STRUCTURE

ADMINISTRATION / DESIGN TEAM OVERSEES ALL FUNCTIONS

Governance / administrative structure:

- Provide resources to facilitate system development
- Implement and sustain the service
- Education and ongoing training of staff
- Interpret response team effectiveness data to manage resources
- Application of process improvement strategies to improve system and to reduce future occurrences

AFFERENT EVENT DETECTION AND RESPONSE TRIGGERING

- Selection / diagnostic /triggering criteria, Ten Signs of Vitality
- Human and technologic monitoring with alarm limits
- Mechanism for triggering response

EFFERENT CRISIS RESPONSE, RRT/MET

- Resources arrive quickly: first response <5 min. for RN; 15 min. for MD
 - Personnel (possess a defined set of competencies)
 - Equipment
 - Method for assessing urgent unmet needs
- Crisis Intervention: VIPPS algorithm
 - Crisis resolved, opportunity for education of floor staff
 - Crisis continues, transfer to ICU
- Specialized Teams:
 - Cardiac Arrest
 - Trauma
 - Stroke
 - AMI

QUALITY ASSURANCE DATA COLLECTION AND ANALYSIS FOR PROCESS IMPROVEMENT

- Event rate/1000 admissions:
 - Resources needed
 - Analysis of events to improve process and reduce future events
 - Outcomes
- Feedback of evaluation of events and outcomes for process improvement and to foster adoption by:
 - Clinicians and providers
 - System designers
 - Patient / family
 - Administration

Rapid Response System Overview

1. **Design/ Implementation Team.**
Important to identify physician and RN champion. This team meets to determine the type of system appropriate for your institution.
 - a. Director of ICU/ or other physician advocate
 - b. ICU or critical care nurse manager
 - c. Critical Care and Med/Surg educators
 - d. Intensivist/Hospitalist
 - e. Critical Care and Med/Surg RNs
 - f. Rapid Response System team coordinator
 - g. On a as needed basis representatives from:
 - 1) QA for data acquisition and management and continuous process improvement
 - 2) ED
 - 3) Respiratory therapy
 - 4) Lab
 - 5) EKG
 - 6) Radiology
 - 7) Pharmacy
2. Composition of the MET:
 - a. RN first responder vs. intensivist first responder.
 - b. RN responder for conventional (broad) MET criteria.
 - c. RN vs. Intensivist / Hospitalist responder for conservative (highest risk patients) MET criteria / STaRRT.
 - d. Additional MET members including respiratory therapy, laboratory, EKG, others.
3. Protocolized therapy to be initiated by the frontline provider based on:
 - a. Primary respiratory failure, RR > 30, SaO₂ >90.
 - b. Significant deterioration of GCS or GCS of ≤ 8, RR <6 and SaO₂ <90.
 - c. Shock criteria.
 - d. Ten Signs of Vitality (10 SOV)
4. RN responder, protocolize initial assessment and therapy.
5. Intensivists/ Hospitalist responder with protocol therapy specific to disease state i.e., primary respiratory failure vs. primary change in mental status vs. conventional shock.
6. Activation criteria:
 - a. Criteria for the highest risk patients, i.e., high specificity, good sensitivity for high risk patients, low false positive rate (STaRRT).
 - b. Conventional met criteria with high sensitivity, lower specificity.
 - c. Simulations including multiple case studies with activating criteria as well as simulations approximate, but not meeting criteria. The latter would facilitate differentiating true positives from false positive activations (improving recognition, identification and activation skills).
 - 1) Mock drills with hands on assessment and activation of the STaRRT/ MET similar to what is done for trauma alerts. These are provided in a written/examination format.
 - d. STaRRT/ MET carts to be transported to bedside.
7. RRS bed available in ICU at all times.
8. STaRRT/ MET response to ED vs. already hospitalized patients.

9. Identification of barriers:
 - a. Medical staff buy-in (including late adopters) i.e., concerns regarding loss of control and economic advantage.
 - b. Competing physician groups.
 - c. Department turfs, i.e., ED, ICU, surgical, recovery room, etc.
 - d. Financial resources, administration.
 - e. Lack of compelling data.
 - f. RN compliance without full buy-in or push back from medical staff.
 - g. Requires significant investment in education of staff, restructuring of hospital resources

10. Methods to overcome barriers:
 - a. Proactive communication and education of all stakeholders with their involvement and input during program development, in particular medical staff and nursing.
 - b. Continued PR and education of administration and hospital staff regarding benefits of the RRS to facilitate buy-in including one-to-one and group interactions, written materials, posters and formal education presentations.
 - c. Provide frequent feedback to the medical staff and administration, initially monthly and subsequently quarterly on numbers of alerts, time to interventions, and outcomes including incidence of unexpected cardiac arrests, to facilitate adoption.
 - d. Work with quality assurance regarding the RRS meeting JCAHO, state and Health Care Financing Administration (HCFA) regulatory requirement in process improvements.
 - e. Assertiveness training to educate frontline providers that they are truly empowered independent of barriers that may arise.

STUDY ABSTRACT

Effect of a Rapid Response System for Patients in Shock On Time to Treatments and Mortality Over Five Years

Sebat F; Musthafa AA; Johnson D; Kramer A; Shoffner D; Eliason M; Henry K; Spurlock B

Context

Treatment of non-traumatic shock is often delayed or inadequate due to insufficient knowledge or skills of frontline health care providers, limited hospital resources, and lack of institution-wide systems to ensure application of best practice. As a result, mortality from shock remains high.

Objective

To determine if outcomes will be improved by a hospital-wide system that educates and empowers clinicians to rapidly identify and treat patients in shock using treatment protocols based upon best practice, mobilization of a rapid response team and rapid transfer to ICU.

Design

A single-center trial before and after implementation of a hospital-wide Rapid Response System for early identification and treatment of patients in shock.

Setting

180-bed community regional referral center in northern California.

Patients

511 adult patients meeting criteria for shock over a five year period.

Interventions

This system included a comprehensive educational program for clinicians, criteria for activation and Rapid Response Team using protocol goal-directed therapy, early transfer to ICU and outcome feedback to staff to foster adoption.

Outcome Measures

We measured times to key interventions and hospital mortality one-and-a-half years before through five years after system initiation.

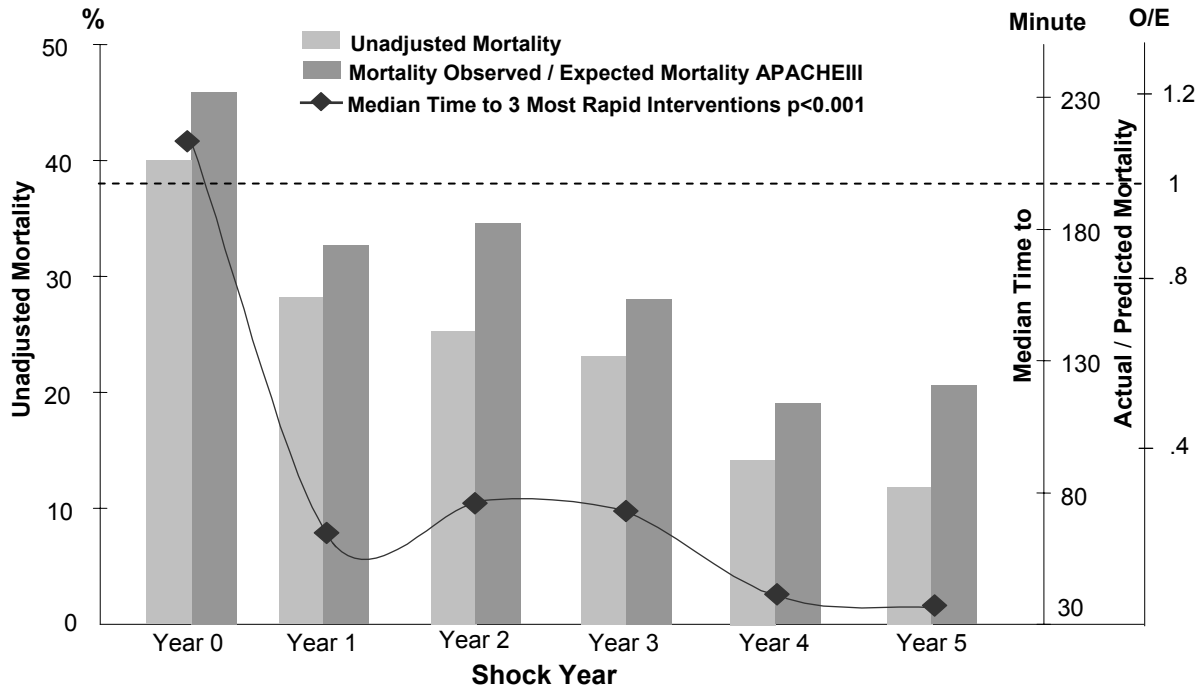
Results

Times to interventions and mortality decreased significantly over time before and after adjusting for confounding factors. Interventions times including shock alert activation, infusion of two liters of fluid, central line placement and antibiotic administration were significant predictors of mortality ($p < 0.05$). Overall and septic subgroup shock mortality decreased from before system implementation through protocol year five from 40% to 11.8 and 49% to 10% respectively ($p < .001$).

Conclusion

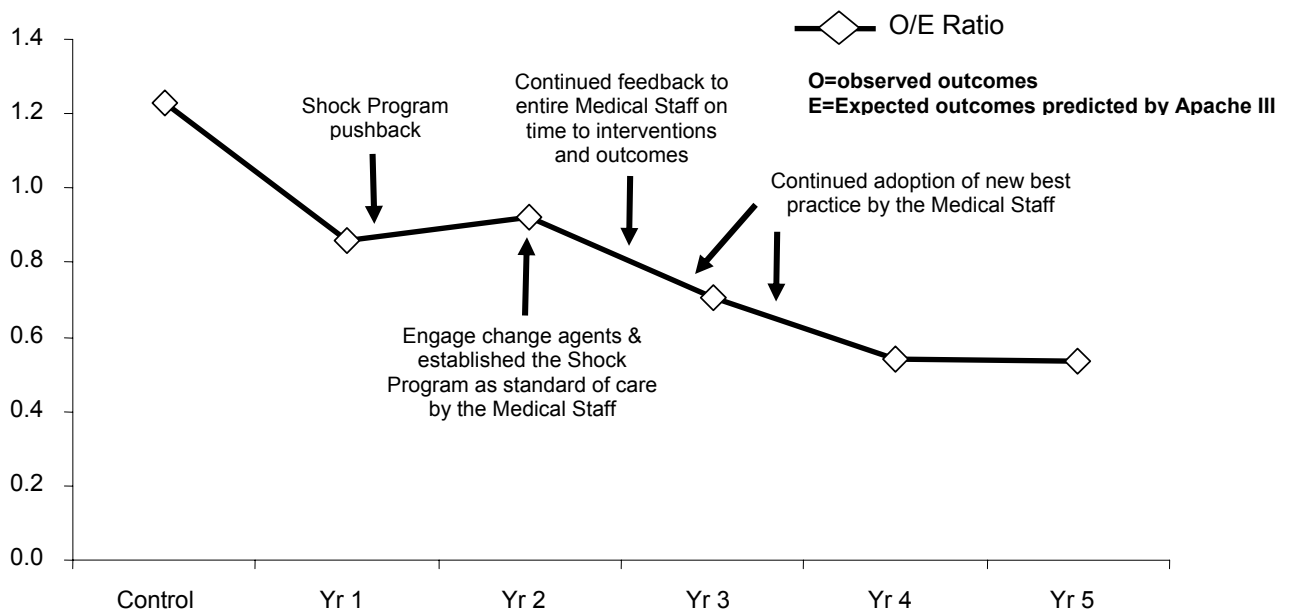
Over five years, a Rapid Response System for patients in shock continued to reduce time to treatment which resulted in a continued decrease in mortality. By year five, only three patients needed to be treated to save one additional life.

Hospital Mortality vs. Median Time to 3 Most Rapid Interventions



Observed (O) / Expected (E) mortality using Apache III predictions.
(O/E = 1 when observed mortality is equal to expected mortality).
Chi-Square test of association: Reject null hypothesis of no difference among rates at $p < 0.001$.
Cochran-Armitage Test for Trend: Reject null hypothesis of no trend in rates at $p < 0.001$.

Shock Program O/E Outcomes



TYPES OF CRITICAL ILLNESS LEADING TO RAPID DETERIORATION

Hypovolemic Shock

Low blood volume decreasing preload and cardiac output due to GI bleed, trauma, or severe dehydration.

Septic or Distributive Shock

Decrease in vascular tone and volume causing hypotension due to infection, pancreatitis, trauma or other sources of tissue injury

Cardiogenic Shock

Decrease cardiac function due to a significant muscle, valve or rhythm problem resulting in a major drop in cardiac output.

Obstructive Shock

Obstruction of blood flow from the heart due to pulmonary embolism, cardiac tamponade or tension pneumothorax.

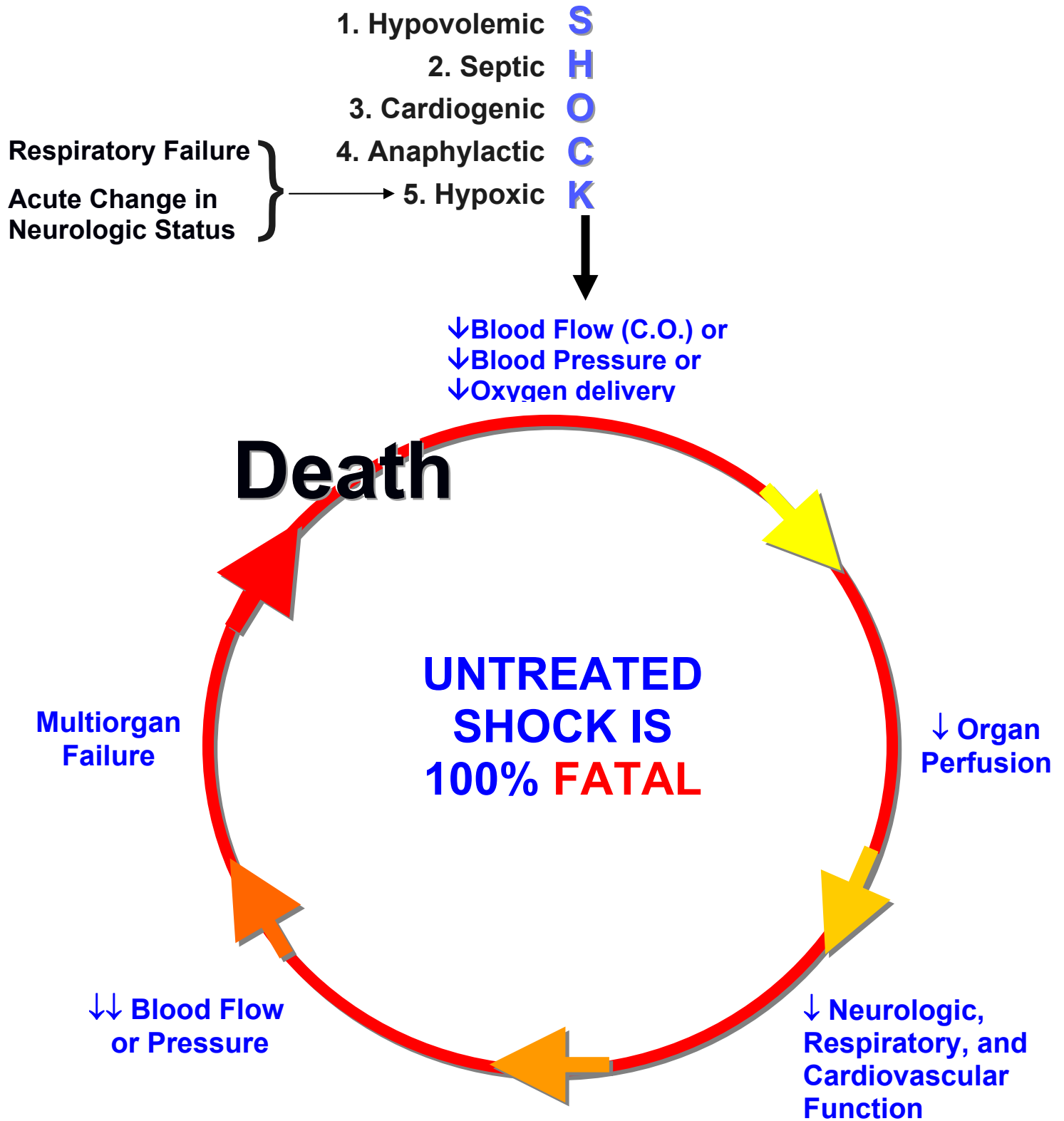
Anaphylactic Shock

A form of distributive shock as a result of allergic reaction to drug or environmental agent frequently associated with bronchospasm.

Respiratory or Hypoxia Shock

Primary respiratory failure or acute change in neurologic status leading to global tissue hypoxia, cardiovascular decomposition.

CYCLE OF SHOCK / CRITICAL ILLNESS



EARLIER RECOGNITION & EARLY GOAL DIRECTED THERAPY WILL INTERRUPT THE CYCLE

Ten Signs of Vitality (10 SOV)

A program to help clinicians recognize essential physiologic signs of life with a goal of decreasing unexpected cardiac arrest and mortality.

This Ten Signs of Vitality and STaRRT educational program empowers frontline providers to recognize critical illness earlier, rapidly initiate best practice resuscitation protocols while mobilizing intuitional resources. This educational package becomes the foundation for development and implementation of a Rapid Response System (RRS). It is expected that this program will decrease the incidence of unexpected cardiac arrest and patient morbidity and mortality. A growing number of hospitals are currently implementing this curriculum for nurses and other clinicians as a baseline competency and an educational program for implementation of a RRS.

The DVD and CD which contains containing the Ten Signs of Vitality and STaRRT programs allow you to modify all of the recourses as outlined in the table of contents to suit your facility's needs. The DVDs contain lectures by Frank Sebat, MS, MD, FCCP, FCCM a critical care practitioner and member of the Society of Critical Care Medicine Task Force on Rapid Response Teams and Sue Henderson, MSN, NP, CCRN, Critical Care Educator at Fremont-Rideout Health Group and co-developer of the 10 SOV and STaRRT. These programs along with their examinations can be viewed by the students at your site or an instructional tool for your educator.

STaRRT Activation Card Worn by Nursing Staff

FRONT

STaRRT ALERT / ACTIVATION CRITERIA
10 Signs of Vitality

Temp	≤36° C
Pulse	<50 >100/min
Pain	New or sig. increase
RR	<6 or >20/min
SaO ₂	<90% & ↑ FiO ₂
BP	SBP <90 MAP <60
LOC	Anxiety→Lethargy
CAP	>3 seconds
UO	<30 cc/hr x 2 hr.*
ScvO ₂	<65 or LA >2.0

ABNORMALITY OF ONE OF 10 SOV- TRIGGERS ASSESSMENT OF ALL 10

ANY TWO BELOW RED LINE- ACTIVATES ALERT

*excluding renal failure

Call STaRRT Alert ext. 7500 & give Room #

S-BAR COMMUNICATION

S = Situation	Reason for call, acute problem
B = Background	Reason for adm, current Dx, PmHx, I/O, meds, chart available
A = Assessment	10 SOV
R = Recommendation	Your suggested interventions. Order sheet available

BACK

VIPPS RESUSCITATION

V Ventilate, assure adequate airway, oxygenate SaO₂ >90%

I Rapidly infused crystalloid or colloid except pulmonary edema

P Pressors MAP >60 & assess the pump. JVD/CVP, stethoscope, EKG, cardiac echo?

P Pharmacology, i.e., bronchodilators, steroids, antibiotics, anticoagulants, NTG, APC, etc.

S Specific interventions, endoscopy, surgical consult, etc.

Decreased organ perfusion; its resuscitation & lab

STaRRT PATIENT LAB

<ul style="list-style-type: none"> • ABG • H/H, Lytes STAT • 12 lead EKG • CXR • If sepsis suspected or temp is < 36° or > 38°, or antibiotics to be started: CBC w/diff, 2 blood cultures, sputum GS/CS, U/A & urine GS/CS 	<ul style="list-style-type: none"> • Serum lactate x 2, 4 hrs apart • Metabolic & liver panel • Type and screen • CPK/Troponin • D.I.C. screen • Amylase/Lipase • LDH, PO₄
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