Historical Perspectives, Current Developments and Future Challenges in Critical Care Medicine

Essay
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Presented By:
Mohammad Ali Abd EL-Rahman El-Bouhy

M.B.B.Ch.

Under the supervision of

Prof.Dr. Bassel Mohammad Essam Nour El-Din
Professor of Anesthesia and Intensive care
Faculty of Medicine
Ain Shams University

Dr. Milad Rajaey Zekry
Lecturer of Anesthesia and Intensive Care
Faculty of Medicine
Ain Shams University

Dr. Hany Ahmed Abd El-kader
Lecturer of Anesthesia and Intensive Care
Faculty of Medicine
Ain Shams University

Faculty of Medicine
Ain-Shams University
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المنظورات التاريخية والتطورات الراهنة والتحديات المستقبلية

في طب العناية المركزة

رسالة

توطئة للحصول على درجة الماجستير في الرعاية المركزة

مقدمة من

الطبيب / محمد على عبد الرحمن البوهى

بكالوريورس الطب والجراحة العامة

تحت إشراف

أ.د./ باسل محمد عصام نور الدين

أستاذ التخدير والرعاية المركزة

كلية الطب جامعة عين شمس

د/ ميلاد رجائى زكرى

مدرس التخدير والرعاية المركزة

كلية الطب جامعة عين شمس

د/ هانى احمد عبد القادر

مدرس التخدير والرعاية المركزة

كلية الطب جامعة عين شمس

كلية الطب جامعة عين شمس

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AC.....Assisted Ventilation.

ACLS .....Advanced Cardiovascular Life Support.

ACMV ..... Volume Assist-Control Mode.

AED.....Automated External Defibrillator.

AHA ..... American Heart Association.

ALG..... Antilymphocyte Globulin.

AMI.....Acute Myocardial Infarction .

AND.....Allow Natural Death.

APRV.....Airway Pressure Release Ventilation.

ASV.....Adaptive Support Ventilation.

BC.....Before Christ.

BLS.....Basic Life Support.

BPAP.....Bilevel Positive Airway Pressure.

CABG.....Coronary Artery Bypass Graft.

CAD.....Coronary artery disease.

CCM.....Critical Care Medicine.

CCUS .....Coronary Care Units .

CMV.....Controlled Mechanical Ventilation.

CO ..... Cardiac output.

CPAP.....Continuous Positive Airway Pressure.

CPR .....Cardiopulmonary Resuscitation .

CS.....Cardiogenic Shock.

CT.....Computed Tomography .

DCBB.....Dual Control Interbreath .

DCD.....controlled Donation after Cardiac Death.

DCWB.....Dual Control Within a Breath.

DNAR.....Do Not Attempt Resuscitation.

DVT.....Deep Venous Thrombosis.

EMS.....Emergency Medical Services .

EMTS.....Emergency Medical Technicians .

EPAP.....Expiratory Positive Airway Pressure.

ET.....Endotracheal Intubation.

FBAO.....Foreign Body Airway Obstruction.

HLA .....Human Leukocyte Antigens.

IABP .....Intra-Aortic Balloon Pumping.

ICU.....Intensive Care Unit.

IMPRV.....Intermittent Mandatory Airway Pressure . release Ventilation.

IMV.....Intermittent Mechanical Ventilation.

INR.....International Normalized Ratio.

IPAP.....Inspiratory Positive Airway Pressure.

ITD.....Impedance Threshold Device.

IV.....Intravenous .

IU.....International Unit.

IVC .....Inferior Vena Cava .

LMWH .....Low-Molecular-Weight Heparin.

MELD.....Model of End stage Liver Disease

MHC.....Histocompatibility Complex.

MICUs.....Medical ICUs.

MMV..... Mandatory Minute Ventilation.

MRSA.....Methicillin-Resistant Staphylococcus Aureus

NAEMSP.....The National Association of EMS Physicians

NRCPR.....The National Registry of CardioPulmonary.
Resusitation.

OHCA..... Out-of Hospital Cardiac Arrest.

PA.....Pressure Augmentation .

PAOP ..... Pulmonary Artery Occlusion Pressure.

PAV.....Proportional Assist Ventilation.

PCI.....Percutaneous Coronary Intervention.

PCV.....Pressure-Controlled Ventilation.

PE.....Pulmonary Embolism .

PEEP.....Positive End Expiratory Pressure.

PIOPED.....Prospective Investigation of Pulmonary
Embolism Diagnosis.

PRVC .....Pressure Regulated Volume Control.

PSV..... Pressure Support Ventilation .

ROSC.....Return Of Spontaneous Circulation

SCV.....Sudden Cardiac Arrest.

SIMV.....Synchronized Intermittent Mechanical

Ventilation.

SICUs.....Surgical ICUs

SVR.....Systemic Vascular Resistance.

UFH.....Unfractionated Heparin.

UK.....United Kingdom

UPET.....Urokinase Pulmonary Embolism Trial.

VAPS.....Volume Assured Pressure Support.

VCV .....Volume Cycled Ventilator.

VF.....Ventricular Fibrillation.

VISA.....Vancomycin Intermediately susceptible S.Aureus.

VRE.....Vancomycin Resistant Enterococci.

VRSA.....Vancomycin Resistant S. Aureus.

VS.....Volume Support.

VSP.....Volume Support Plus.

VT.....Ventricular Tachycardia.

VTE.....Venous Thromboembolism.

AIM OF THE WORK

This essay is focused on the evolution, current progress and future challenges in critical care medicine.

INTRODUCTION

Intensive care medicine originated in response to an epidemic of poliomyelitis in Copenhagen more than fifty years ago. From this humble beginnings, intensive care has developed into a specialty at the forefront of organ support and other advances in medicine and surgery ***(Berthelsen and Cronqvist , 2003).***

Cardiac arrest represents an event that can occur suddenly and often without premonitory signs, characterized by sudden loss of consciousness and breathing after cardiac output ceases and both coronary and cerebral blood flows stop. Restarting of the blood flow by cardiopulmonary resuscitation potentially re-establishes some cardiac output and organ blood flows. This study summarizes the major events that encompass the history of cardiopulmonary resuscitation, beginning with ancient history and evolving into the current American Heart Association's commitment to save hearts ***(Eisenberg et al., 2007)***.

The early history of shock is related primarily to traumatic shock. More recent history centers on differentiation of clinical syndromes and individual characteristics. Definitions, classification systems, pathogenic theories, and treatments have evolved. Progress has been aided by constant development of improved assessment technologies. Today, shock is not a single syndrome and the definition of shock no longer is descriptive in nature. The most accepted current definition involves an oxygen supply/demand imbalance that can have various causes as hypovolemia, cardiac dysfunction, vascular failure, or obstructive processes ***(Kumar and Parrillo , 2001)***.

Venous thromboembolism remains a common and lethal condition As the history of this disease illustrates, advances continue to be made and it is anticipated that with newer diagnostic studies and

anticoagulants under development, diagnosis and treatment of pulmonary embolism will continue to improve ***(Dalen, 2002).***

The first chemotherapeutically effective antibiotic (penicillin) was discovered in 1929 by Alexander Fleming (1881-1955). Since 1945, thousands of different antibiotics produced by fungi, actinomycetes or unicellular bacteria have been isolated ***(Khardori, 2006).***

Organ transplantation is one of the most remarkable and dramatic therapeutic advances in medicine during the past 60 years. This field has progressed initially from what can accurately be termed a "clinical experiment" to routine and reliable practice, which has proven to be clinically effective, life-saving and cost-effective. This remarkable evolution stems from a serial confluence of: cultural acceptance; legal and political evolution to facilitate organ donation, procurement and allocation; technical and cognitive advances in organ preservation ***(Starzl, 2000).***

Major events in the history of ethics and law in the ICU, covering the evolution of ICUs, ethical principles, informed consent and the law, medical decision-making, cardiopulmonary resuscitation, withholding and withdrawing life-sustaining therapy, legal cases involving life support, advance directives, prognostication, and futility and the allocation of medical resources ***(Truog et al., 2008).***

Chapter (1) Evolution of the intensive care unit.

Introduction

Intensive care medicine originated in response to an epidemic of poliomyelitis in Copenhagen fifty years ago. From these humble beginnings, intensive care has developed into a specialty at the forefront of organ support and other advances in medicine and surgery. Critical care has only recently been recognised as a specialty, being awarded this status in the UK in June 1999. Unfortunately, the development of intensive care in most countries has not been co-ordinated by a long-term national or even regional strategic plan. One of the most important aspects of intensive care evolution has been a change in emphasis, from the intensive care unit as a location in which to gather critically ill patients, towards intensive care medicine as an evidence and knowledge base directed at providing for the critically ill throughout the hospital ***(Berthelsen and Cronqvist, 2003).***

The first intensive care units were set up for reasons we would recognise now; grouping patients by severity of illness enabled attention to be directed towards the most dependent patients. The idea of concentrating the sickest patients together was not new. It had already been used in postoperative recovery areas and in temporary units set up in response to various crises, such as the Coconut Grove fire in Boston, Massachusetts in 1942. Other factors were needed to drive change from considering intensive care as a unit to a philosophy for managing critically ill patients throughout a hospital ***(Grenvik and Pinsky , 2009).***

Further developments

Initially, although most general ICUs admitted medical and surgical patients of all kinds, they tended to favor certain types of patients based on the nature of the hospital patient mix and specialization of the ICU medical teams. Notably absent from this

initial progress was the presence of pediatric ICUs. Pediatric intensive care became relevant in pediatric departments and major hospitals for sick children; and then separately for neonatal support. Gradually, the knowledge and technology was developed for intubation and mechanical ventilation of smaller newborns who were frequently premature and the neonatal ICU was established. In the United States, medical ICUs split off as separate units in large, particularly tertiary care hospitals and became the domain of pulmonary specialists with increasing emphasis on broader aspects of care of critically ill patients. Because of the greater need for intensive care of surgical patients, especially postoperatively after increasingly complex procedures, large hospital facilities in the United States established separate ICUs for general surgery, cardiothoracic surgery, trauma, neurosurgery, burns, and transplantation **(Grenvik and Schaefer, 2004).**

Initially, these units were frequently directed by anesthesiologists, but increasingly specialty surgeons and internists became involved in the management of these patients. In 1959, the American Hospital Association began to collect statistical information on ICUs. At that time there were 238 ICUs in short-term acute-care hospitals. However within 6 years, over 90% of large American hospitals with more than 500 beds had ICUs. Today, practically all acute-care hospitals not only in the United States but throughout the world have at least one ICU. Furthermore, with the change in health care economics, patients are being discharged sooner increasing the average disease severity of the remaining ICU patients. Furthermore, since maximal throughput of care usually requires some short-term stays in ICUs, the proportion of hospital beds being allotted to ICUs has continued to increase worldwide ***(Grenvik and Schaefer, 2004).***

Throughout the 1960s there were reports from individual intensive care units sharing experiences of this novel form of care.During the 1970s and 80s the modern concept of critical illness developed. Research and clinical experience identified common features of sepsis and multiple organ failure. Alongside the traditional

medical model of diagnosis, treatment and cure, the parallel model of identification and correction of physiological disturbance and support of failing organ systems became established. It was often only one or two enthusiastic clinicians within a hospital who established and managed the intensive care unit. The respiratory system was the only organ system that could be reliably ***(Hanson et al., 2001).***

Much has changed over the last fifty years. In many ways intensive care has developed in response to gaps in service provision. Hospitals have become larger and more specialised, expectations of patients have increased and society has changed. Recruitment to professions with day and night demands is more difficult, so making nursing staff a particularly scarce resource. In this challenging environment intensive care has come of age. An intensive care unit is essential in all acute hospitals, as the skills developed there are in demand throughout the hospital. If the intensive care team is to satisfy patients' needs, the specialty of intensive care medicine must continue to advance and evolve ***(Grenvik and Pinsky , 2009).***

Future challenge

The challenges of critical care medicine are numerous and important for all acute-care medicine. However, three challenges stand out above the rest. First, now that critical care medicine is firmly established as a specialty with defined competencies and training programs and roles in the acute hospital plus national and European certification, it is essential that it maintains its leadership role in all areas. Specifically, leadership in quality care, patient safety, optimizing effective care delivery, and quantifying these effects are major goals and will become the crowning accomplishments of the specialty as a clinical practice. Second, although the major American medical specialties of medicine, surgery, pediatrics, and anesthesiology confirm critical care medicine special competency certification, primary CCM certification in its own specialty needs to be established so that residencies can become part of the training program. Emergency