

UC Davis

UC Davis Previously Published Works

Title

The LIFE TRIAD of emergency general surgery.

Permalink

<https://escholarship.org/uc/item/8t57m68x>

Journal

World Journal of Emergency Surgery, 17(1)

Authors

Coccolini, Federico

Sartelli, Massimo

Kluger, Yoram

et al.

Publication Date

2022-07-25

DOI

10.1186/s13017-022-00447-7

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

COMMENT

Open Access



The LIFE TRIAD of emergency general surgery

Federico Coccolini^{1*}, Massimo Sartelli², Yoram Kluger³, Aleksei Osipov⁴, Yunfeng Cui⁵, Solomon Gurmu Beka⁶, Andrew Kirkpatrick⁷, Ibrahima Sall⁸, Ernest E. Moore⁹, Walter L. Biffi¹⁰, Andrey Litvin¹¹, Michele Pisano¹², Stefano Magnone¹², Edoardo Picetti¹³, Nicola de Angelis¹⁴, Philip Stahel¹⁵, Luca Ansaloni¹⁶, Edward Tan¹⁷, Fikri Abu-Zidan¹⁸, Marco Ceresoli¹⁹, Andreas Hecker²⁰, Osvaldo Chiara²¹, Gabriele Sganga²², Vladimir Khokha²³, Salomone di Saverio^{24,25}, Boris Sakakushev²⁶, Giampiero Campanelli²⁷, Gustavo Fraga²⁸, Imtiaz Wani²⁹, Richard ten Broek³⁰, Enrico Cicuttin¹, Camilla Cremonini¹, Dario Tartaglia¹, Kjetil Soreide³¹, Joseph Galante³², Marc de Moya³³, Kaoru Koike³⁴, Belinda De Simone³⁵, Zsolt Balogh³⁶, Francesco Amico³⁶, Vishal Shelat³⁷, Emmanouil Pikoulis³⁸, Isidoro Di Carlo³⁹, Luigi Bonavina⁴⁰, Ari Leppaniemi⁴¹, Ingo Marzi⁴², Rao Ivatury⁴³, Jim Khan⁴⁴, Ronald V. Maier⁴⁵, Timothy C. Hardcastle^{46,47}, Arda Isik⁴⁸, Mauro Podda⁴⁹, Matti Tolonen⁵⁰, Kemal Rasa⁵¹, Pradeep H. Navsaria⁵², Zaza Demetrashvili⁵³, Antonio Tarasconi⁵⁴, Paolo Carcoforo⁵⁵, Maria Grazia Sibilla⁵⁵, Gian Luca Baiocchi⁵⁶, Nikolaos Pararas³⁸, Dieter Weber⁵⁷, Massimo Chiarugi¹ and Fausto Catena⁵⁸

Abstract

Emergency General Surgery (EGS) was identified as multidisciplinary surgery performed for traumatic and non-traumatic acute conditions during the same admission in the hospital by general emergency surgeons and other specialists. It is the most diffused surgical discipline in the world. To live and grow strong EGS necessitates three fundamental parts: emergency and elective continuous surgical practice, evidence generation through clinical registries and data accrual, and indications and guidelines production: the LIFE TRIAD.

Keywords: Emergency General Surgery, Formation, Data, Outcomes, Effectiveness, Learning, Planning

Background

Emergency General Surgery (EGS) is a surgical discipline encompassing all traumatic and non-traumatic surgical emergencies. EGS is the most diffuse practiced surgical discipline in the entire world. Almost all general surgeons deal daily with surgical emergencies. The emergency general surgeon can be currently considered as the last surgeon who is able to manage surgical emergencies

in almost every body region within an emergency setting including traumatic and non-traumatic conditions. This entails taking critical and serious decisions that cannot be reversed within a short time and may affect life. It requires a special leading personality that has the adequate knowledge, skills, professionalism, and critical reasoning to achieve this highly demanding task. In fact, the acuity of the patients admitted for acute surgical diseases is unique and deserves special attention [1]. Recent studies have shown that EGS patients are at a uniquely higher risk for complications following surgery, with EGS patients up to eight times more likely to die compared to patients undergoing the same procedure electively. Approximately half of all patients undergoing EGS will

*Correspondence: federico.coccolini@gmail.com

¹ General, Emergency and Trauma Surgery, Pisa University Hospital, Via Paradisia 1, 56100 Pisa, Italy
Full list of author information is available at the end of the article



have a postoperative complication [2, 3]. The emergency general surgeon is the one trained to manage together both surgical and physiological derangements of such complicated patients, especially in an era when patients are becoming older and older. Some aspects, however, must be analyzed and communicated about this diffused and underestimated discipline. Notwithstanding the EGS importance and diffusion, however, it is astonishingly an orphan specialty. In some places, acute care surgery concept is diffused, but it is different from EGS. Acute care has been developed and diffused within some countries. It encompasses several skills and a specific training that cannot be applied universally due to its specificity for the healthcare systems in which it was originally developed. In fact, in most part of the countries, EGS is differently distributed among the different actors where the general surgeon is the pivot around which the system moves and ICU doctors and orthopedics/traumatologists are differently included. This is even more true in referral or hub hospitals where the most severe emergencies are centralized, and the patients' flux is more represented. In low-middle-income countries, EGS is the first surgical need to achieve in rural or city hospitals. In this context, dedicated EGS wards may make major improvements in surgically sick patients. Although the importance of EGS is understood, the interest to promote it is limited. This is mainly due to the lack of adequate economic gain, considering especially the shifts and the number of hours of extra-work. Hospital managers are always in difficulty with EGS and all the emergency disciplines due to the continuous drain in funds linked to their activity. As a consequence, investments and long-term plans are always lacking. This is paradoxical because EGS uses and influences a lot of hospital and sanitary systems resources: good plans and organizational efforts would result in an optimized integration of such diffused discipline.

Main text

During the daily practice of most of the general surgeons around the globe, the evaluation and management of surgical emergencies is one of the main activities. Each one of us started to manage surgical emergencies very early during his/her residency.

The residency formation program is different thorough the world and the various countries but the most complete one would be the one combining traumatic and non-traumatic surgical emergencies together with elective surgical activity in the different fields of surgery. Nowadays, no univocal training/residency plan definition for the emergency general surgeon exists. Years ago, was advocated the necessity of at least, a continent-based training program [4]. At present, however, it has not been realized nor planned.

One of the points during general surgical training is the consideration into which the emergencies are posed. It is a common view that if one surgeon is good in his/her own specialty he/she is capable by definition to manage with surgical emergencies. This presumption is incorrect. Emergency General Surgery is a well-defined surgical specialty and necessitated of a dedicated training and update program in order to be performed at best. As already said EGS was identified as multidisciplinary surgery performed for traumatic and non-traumatic acute conditions during the same admission to the hospital. EGS represents the easiest viable way to provide an affordable and high-quality level of care to emergency surgical and trauma patients [5]. As all well-defined surgical specialties, EGS must have a formation and evaluation project and it is actually a reality thanks to the World Society of Emergency Surgery (WSES).

As with the critically injured trauma patients, attention to physiological derangement represented by the **LETHAL triad** is far more important than definitive surgery in reducing the risk for the patients. Similarly, in EGS the **LIFE TRIAD** must be respected and promoted to allow this specialty to be fully effective to grow and to offer the best service to sick patients (Fig. 1).

These three main aspects are as follows:

- Training and continuous surgical activity (emergency and elective)—to maintain and accrue new surgical skills
- Data accrual, registries implementation, and research—to ask questions and produce answers

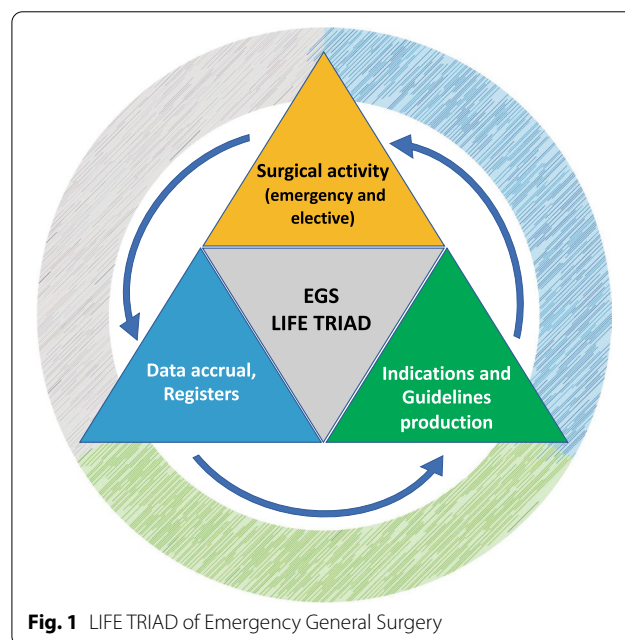


Fig. 1 LIFE TRIAD of Emergency General Surgery

- Indication and guidelines production and update— for a more universal code of management

Surgical activity must be adequate and continuous as must encompass emergency surgical procedures and elective visceral surgical activity. A good emergency general surgeon cannot be fully trained in performing emergency procedures if they are not continuously exposed to elective visceral surgical interventions. This is even more evident if considering the mini-invasive approach and laparoscopic techniques. On the other hand, with fewer open procedures, these skills must be maintained. The necessity to know surgical interventions and their possible variations in order to face emergency situation mandates experience in elective general surgery. The expertise obtained from elective activity allows declining the general surgery to the emergency setting. The EGS sometimes imposes to modify anatomy (temporarily or definitively) to allow the physiology to be restored; the easiest example may be the open abdomen procedures. For these reasons, hospital directors, regional and national healthcare managers, and providers must warrant enough room for the EGS dept. to perform elective and emergency surgical procedures. This will translate into reduced human and economic costs in emergency patients management.

Data accrual and registry implementation are fundamental in producing data to analyze activity and to study large-scale effects of EGS. Limited data accrual is the most limiting defect of many surgical specialties. Examples of effective nation-wide data accrual have been shown by US National Trauma and Emergency Surgery Quality Improvement Programs. They are, however, nation-limited data registries, effective but within the nation in which they are developed and utilized. In EGS randomized trials or complex methodological design studies may result very difficult to realize. For this reason, no high-quality evidence exists in many fields. EGS at present can count on the Web-based International Register of Emergency Surgery and Trauma (WIRES-T) (www.clinicalregisters.com) that will overcome this lacking and will allow to perform large-scale analysis including data from different situations and allowing to compare them [6]. WIRES-T is a worldwide diffuse online registry of all the operative and non-operative management of surgical and trauma emergencies. It is free and open to participation. This will give effective and useful answers to the thousands of open questions in EGS. All those who will regularly enter patients and update data will participate in the derived publications. Thanks to this common effort, several high-quality evidence-based guidelines and reviews will emerge and improvements to the existing guidelines will be completed. These data that were

previously unable to be captured can now be used more readily as system capacities for data acquisition, storage, and processing are becoming more easily accessible. Greater access to technology can provide EGS clinicians with more data than ever before. New data collection methods can be utilized to address the need for EGS-specific process and outcome metrics as well as quality improvement programs. Future improvements and developments in big data can inform and guide the further growth of EGS as a new surgical specialty.

Indications and guidelines production is a substantial part to diffuse good clinical and surgical practice. Guideline development is only possible through the availability of high-quality data and experts who develop consensus to define the best strategies for specific scenarios where no definitive data may be obtained. Many diseases in fact have been deeply investigated and plenty of literature works exist. A few others, however, due to the paucity of cases and their scattered diffusion, have not been so effectively studied. This is why registries and experts are vital for EGS. The leading societies have the duty and the responsibility to promote expert discussion and production of guidelines. They must offer open and wide options to allow worldwide coming experts to share data, experiences, and opinions in order to obtain the most shared and diffusible guidelines and indications possible.

Conclusion

The LIFE TRIAD is a concept that must spread and be part of the EGS common practice. As far as it will be the leading light of this great specialty, it will grow and diffuse taking its fruit and effects in each corner of the planet. EGS best practice needs surgeons fully trained to perform general surgical procedures in both elective and emergency settings. They must practice routinely in both fields taking care to accrue data and following the indications and guidelines given by the leading societies in order to provide the best possible care to patients.

Abbreviations

EGS: Emergency General Surgery; WSES: World Society of Emergency Surgery; WIRES-T: Web-based International Register of Emergency Surgery and Trauma.

Acknowledgements

None.

Author contributions

FC contributed to manuscript conception and draft; all authors read, improved, and approved the final manuscript.

Funding

None.

Availability of data and materials

Not applicable.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

¹General, Emergency and Trauma Surgery, Pisa University Hospital, Via Paradisia 1, 56100 Pisa, Italy. ²General and Emergency Surgery, Macerata Hospital, Macerata, Italy. ³Division of General Surgery, Rambam Health Care Campus, Haifa, Israel. ⁴Emergency Surgery, Emergency Surgery of the Research Institute of Emergency Medicine Named After I.I. Dzhanelidze, St. Petersburg, Russia. ⁵Department of Surgery, Tianjin Nankai Hospital, Nankai Clinical School of Medicine, Tianjin Medical University, Tianjin, China. ⁶General Surgery, Ethiopian Air Force Hospital, Bishoftu, Oromia, Ethiopia. ⁷General, Acute Care, Abdominal Wall Reconstruction, and Trauma Surgery Foothills Medical Centre, Calgary, AB, Canada. ⁸Department of General Surgery, Hôpital Principal de Dakar Military Teaching Hospital, Dakar, Sénégal. ⁹Ernest E. Moore Shock Trauma Center at Denver Health, Denver, CO, USA. ¹⁰Trauma Surgery Department, Scripps Memorial Hospital, La Jolla, CA, USA. ¹¹Department of Surgical Disciplines, Immanuel Kant Baltic Federal University, Regional Clinical Hospital, Kaliningrad, Russia. ¹²Emergency and Trauma Surgery, Papa Giovanni XXIII Hospital, Bergamo, Italy. ¹³ICU Department, Maggiore Hospital, Parma, Italy. ¹⁴Unit of General Surgery, CARE Department Henri Mondor University Hospital (AP-HP), Faculty of Medicine, University of Paris Est, UPEC, Créteil, France. ¹⁵College of Osteopathic Medicine, Rocky Vista University, Parker, CO 80134, USA. ¹⁶General Surgery, Pavia University Hospital, Pavia, Italy. ¹⁷Emergency Medicine Department, Radboud Universitair Medisch Centrum, Nijmegen, The Netherlands. ¹⁸Department of Surgery, College of Medicine and Health Sciences, UAE University, Al-Ain, UAE. ¹⁹General Surgery Department, Monza University Hospital, Monza, Italy. ²⁰Department of General and Thoracic Surgery, University Hospital of Giessen, Giessen, Germany. ²¹Emergency and Trauma Surgery, Niguarda Hospital, Milan, Italy. ²²Emergency and Trauma Surgery, Gemelli University Hospital, Rome, Italy. ²³General Surgery Department, Mozyr Hospital, Mozyr, Belarus. ²⁴ASUR Marche, AV5, Hospital of San Benedetto del Tronto, San Benedetto del Tronto, Italy. ²⁵Dipartimento Di Chirurgia Generale E Specialistica "Paride Stefanini", La Sapienza University of Rome, Rome, Italy. ²⁶General Surgery Department, Plovdiv University Hospital, Plovdiv, Bulgaria. ²⁷General Surgery Department, Insubria University, Varese, Italy. ²⁸General Surgery Department, Campinas University, Campinas, Brazil. ²⁹Department of Minimal Access and General Surgery, Government Gousia Hospital, Srinagar, Jammu and Kashmir, India. ³⁰Surgery Department, Radboud University Medical Center, Nijmegen, The Netherlands. ³¹Department of Gastrointestinal Surgery, Stavanger University Hospital, Stavanger, Norway. ³²Trauma Department, University of California, Davis, Sacramento, CA, USA. ³³Trauma/Acute Care Surgery, Department of Surgery, Medical College of Wisconsin, Milwaukee, WI, USA. ³⁴Department of Traumatology and Critical Care Medicine, National Hospital Organization Kyoto Medical Center, Kyoto, Japan. ³⁵Visceral and Metabolic Minimally Invasive Surgery, Centre Hospitalier Intercommunal de Poissy/Saint Germain en Laye, Saint Germain en Laye, France. ³⁶Department of Traumatology, John Hunter Hospital and University of Newcastle, Newcastle, NSW, Australia. ³⁷HPB Surgery, Tan Tock Seng Hospital, Tan Tock Seng, Singapore. ³⁸General Surgery, Hospital, National and Kapodistrian University of Athens (NKUA), Athens, Greece. ³⁹Department of Surgical Sciences and Advanced Technologies, University of Catania, Catania, Italy. ⁴⁰General Surgery, San Donato Hospital, Milan, Italy. ⁴¹Helsinki University Hospital and University of Helsinki, Helsinki, Finland. ⁴²Department of Trauma, Hand-, and Reconstructive Surgery, University Hospital Frankfurt, Goethe-University, Frankfurt am Main, Germany. ⁴³Department of Surgery, Virginia Commonwealth University School of Medicine, Richmond, VA, USA. ⁴⁴University of Portsmouth UK & Portsmouth Hospitals University NHS Trust UK, Portsmouth, UK. ⁴⁵Department of Surgery, University of Washington School of Medicine, Harborview Medical Center, Seattle, USA. ⁴⁶Department of Surgery, Nelson R. Mandela School of Clinical Medicine, University of KwaZulu-Natal, Durban, South Africa. ⁴⁷Trauma and Burns Service, Inkosi Albert Luthuli Central Hospital, Department

of Health, KwaZulu-Natal, Mayville, Durban, South Africa. ⁴⁸Division of General Surgery, School of Medicine, Istanbul Medeniyet University, Kadikoy/Istanbul, Turkey. ⁴⁹Department of Surgical Science, University of Cagliari, Cagliari, Italy. ⁵⁰HUS Abdominal Center, Emergency Surgery, Meilahti Tower Hospital, Helsinki, Finland. ⁵¹Department of General Surgery, Anadolu Medical Center, Kocaeli, Turkey. ⁵²Trauma Center, Grootte Schuur Hospital and University of Cape Town, Cape Town, South Africa. ⁵³General Surgery, Tbilisi State Medical University, Tbilisi, Georgia. ⁵⁴Emergency Surgery Department, Parma University Hospital, Parma, Italy. ⁵⁵Department of Morphology, Surgery and Experimental Medicine, University Hospital of Ferrara and University of Ferrara, Ferrara, Italy. ⁵⁶General Surgery, Department of Clinical and Experimental Sciences, University of Brescia, Brescia, Italy. ⁵⁷Department of General Surgery, Royal Perth Hospital, Division of Surgery, School of Medicine, The University of Western Australia, Perth, Australia. ⁵⁸Emergency and Trauma Surgery, Bufalini Hospital, Cesena, Italy.

Received: 2 February 2022 Accepted: 17 June 2022

Published online: 25 July 2022

References

1. Catena F, Biffl W, De Simone B, Sartelli M, Di Saverio S, Kluger Y, et al. Emergency general surgeons: the special forces of general surgery (the "navy seals paradigm"). *World J Emerg Surg.* 2020;15(1):11.
2. Havens JM, Peetz AB, Do WS, et al. The excess morbidity and mortality of Emergency General Surgery. *J Trauma Acute Care Surg.* 2015;78:306–11.
3. Kassir MT, Owen RM, Perez SD, et al. Risk factors for 30-day hospital readmission among general surgery patients. *J Am Coll Surg.* 2012;215:322–30.
4. Coccolini F, Lazzareschi D. Isn't it time to start speaking about "European surgeons"? *World J Emerg Surg.* 2009;4:27.
5. Coccolini F, Kluger Y, Ansaloni L, Moore EE, Coimbra R, Fraga GP, et al. WSES worldwide Emergency General Surgery formation and evaluation project. *World J Emerg Surg.* 2018;13:13.
6. <https://www.clinicalregisters.org/wires-t/>. Last visit 12 Jan 2022

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

