

Med Klin Intensivmed Notfmed 2022 · 117: 269–275

<https://doi.org/10.1007/s00063-021-00778-4>

Received: 27 October 2020

Revised: 28 November 2020

Accepted: 15 December 2020

Published online: 24 January 2021

© Springer Medizin Verlag GmbH, ein Teil von

Springer Nature 2021

Redaktion

M. Buerke, Siegen



P. Kovacevic¹ · F. J. Meyer² · O. Gajic³

¹ Medical Intensive Care Unit, University Clinical Centre of Republic of Srpska and Medical School of Banja Luka, Banja Luka, Bosnia and Herzegovina

² Medical faculty, University of Heidelberg, Heidelberg, Germany

³ Department of Medicine, Division of Pulmonary and Critical Care Medicine Mayo Clinic, Rochester, USA

Successful implementation of modern critical care in the low-resources country Bosnia and Herzegovina

Single-center experience

Introduction

The development of critical care medicine began in the mid-1950s in response to a poliomyelitis outbreak at the time, where the mass application of mechanical ventilation and its subsequent technical advancement helped manage large numbers of patients with respiratory failure [1–3]. This branch of medicine evolved much faster in high-income countries (HIC) than in low- and middle-income countries (LMIC) [4]. Seventy years later, mankind's encounter with another pandemic (severe acute respiratory syndrome coronavirus 2, SARS-CoV-2) represents another major challenge for critical care medicine [5]. With over two thirds of the population living in LMIC, it is clear that the majority of the world's population does not have access to modern critical care medicine including sufficient numbers of ICU beds and trained staff, which has direct impact on survival rates [6, 7]. This review article presents the successful development and implementation of modern critical care medicine program at a single university medical center in Bosnia and Herzegovina (B&H) and provides useful suggestions which could serve as a model for other LMIC after adaptation for local conditions.

Critical care medicine in LMIC, what have we learned so far?

The burden of critical illness in LMIC is substantial and mortality rates remain unacceptably high compared with HIC with an estimated number of over 8 million premature deaths. Implementation and availability of modern critical care programs in LMIC is essential if this burden is to be reduced especially given the prevalence of infections and increased burden of noncommunicable diseases such as cardiovascular diseases, diabetes, and chronic obstructive pulmonary disease [6, 8, 9].

The main cause for poor outcome of critical illness is limited capacity for nonsurgical critically ill patients, small numbers of medical intensive care units (MICUs), insufficient numbers of ICU beds, and lack of trained staff and poor academic and research resources in LMICs [10–12]. It is estimated that the number of ICU beds in LMIC is 0.1–2.5 ICU beds per 100,000 population [13]. In contrast, HIC have as many as 30 ICU beds per 100,000 population [14]. While data on structure, treatment and outcomes in LMIC are scarce, data from HIC cannot be easily extrapolated [3, 4].

Health care challenges in Bosnia and Herzegovina

Bosnia and Herzegovina (B&H) is one of the countries that emerged after the dissolution of Yugoslavia. It is located in south-eastern Europe (the Western Balkans region). In its recent history, it has seen a 4-year war, international isolation (sanctions imposed by the international community) and profound social and economic devastation, including large numbers of refugees and displaced persons. Each of these developments has left a deep scar in B&H's health care system, including critical care medicine [15]. B&H has four university hospitals (University Clinical Centres, UCCs): UCC Sarajevo, UCC RS in Banja Luka (University Clinical Centre of Republika Srpska), UCC Mostar and UCC Tuzla. These UCCs have surgical intensive care units (SICUs) with few ICU beds (1 ICU bed per 100,000 population) and no formal subspecialty training in critical care medicine. Scarce literature sources indicate that less than 10% of critically ill nonsurgical (medical) patients have access to SICU beds [16]. Currently, the World Bank classifies B&H as a low to middle income country (LMIC) [17]. Many countries worldwide have similar characteristics to B&H. At the beginning of the 21st century, B&H has slowly started to open towards developed European countries

with increase access to knowledge and experience in different areas including healthcare. To assist in this process international institutions and agencies (European Commission, Coimbra Group, Union for International Cancer Control, etc.) offered a number of visiting fellowships and cost reimbursements for B&H clinicians [15].

Chronological development of medical critical care program in UCC RS Banja Luka

Basic critical care education

Developing a health care program requires three crucial resources: trained staff, space, and equipment. Physicians and nurses who do not have knowledge and experience in critical care medicine are not able to treat complex critically ill patients. In process of creation and implementation of medical intensive care unit staff, education is the first step. Such education needs to begin in selected educational institutions with developed, modern critical care medicine and teaching staff. In B&H (Republika Srpska) this process started when the European Commission (EC) supported the training of a young physician in the area of critical care medicine at the University Hospital in Heidelberg, Germany, and the Mayo Clinic in Rochester, MN, USA (2005–2007). Upon completing the training and return to B&H, the physician immediately started with creation of local critical care curriculum (adapted as needed from HIC) and formal critical care program development supported by local health care authorities.

Suggestions for other LMIC settings

- Local community should take a clear and firm dedication to critical care medicine development, and identify physicians and nurses for education at medical centers with highly developed critical care medicine and with competent teaching staff.
- Trained physicians and nurses upon return to their home centers serve as educators to young physicians and

nurses who wish to be trained in critical care medicine.

- Formal recognition and engagement of local health authorities is crucial. To be successful implementation of critical care program has to be supported by the responsible local institutions (Ministry of Health, Medical Faculty, University Hospitals).

Importance of mentorship from developed centers

During educational training at University Hospital in Heidelberg, Germany, and Mayo Clinic, USA, the physician from UCC RS Banja Luka was under direct supervision of critical care expert physician mentors. The benefit was seen in direct education (knowledge and skills transfer) of the visiting physician during his stay abroad and continued support after his return to the home institution. The second step included the mentors' visit to B&H (RS). During the mentors' visit various activities were organized:

- Continuing critical care education at the bedside,
- Didactic lectures,
- Donations of equipment to UCC RS Banja Luka (noninvasive ventilators, monitors, etc.),
- Integrating mentors into the educational system of the local community (visiting professor titles at the Medical School University of Banja Luka),
- Creation of critical care curriculum for further education of new physicians and
- Mentors became jury members for the certifying board exam for critical care medicine in B&H.

Suggestions for other LMIC settings

In addition to sending physicians and nurses for education abroad local health care officials should identify potential mentor(s) who are willing and able to provide necessary long-term support. The central issue is that the mentor and the mentee should be fluent in one common language for an appropriate communica-

tion. In addition, it is helpful if the mentor originally comes from the home country, fluently speaks the local language, and is well integrated abroad. This is not a challenge as many physicians from LMIC immigrate to HIC; a substantial number of them have interest in connection and "giving back" to their home country. These mentors understand the political and socioeconomic situation in the country, understand local customs, rules and laws, and have a keen interest in helping the country of origin.

Founding the first medical ICU (MICU) at UCC RS Banja Luka

Upon return to UCC RS Banja Luka, the physician who was trained abroad first began to apply his knowledge at a pulmonary hospital ward where he introduced noninvasive ventilation for the first time. The use of noninvasive mechanical ventilation in a hospital area where mechanical ventilation had never been used before served as a useful transition towards establishment of formal MICU since it introduces medical staff to a simple form of mechanical ventilation with an apparent clinical benefit in a significant number of patients. Relatively quickly upon the physician's return, key authorities (UCC RS management and Ministry of Health of Republika Srpska) started the project of founding the first MICU at UCC RS Banja Luka.

The first MICU started operating at the end of 2008, three years after the start of critical care medicine education abroad for the first physician. The structure of the first MICU was as follows:

- Staff—two physicians (pulmonologist with critical care medicine education and experienced anesthesiologist) and ten nurses. All nurses were trained for 3 months in the SICU before starting in MICU. Besides two specialists, 10 additional physicians who were top medical students joined the team. Each of junior physicians was to start basic residency training in different primary specialties (e.g., internal medicine, anesthesiology, pulmonology, neurology) and subsequent subspecialty training in critical care medicine. During the

P. Kovacevic · F. J. Meyer · O. Gajic

Successful implementation of modern critical care in the low-resources country Bosnia and Herzegovina. Single-center experience

Abstract

Background. Critical care medicine is a relatively young discipline, developed in the mid-1950s in response to the outbreak of poliomyelitis. The mass application of mechanical ventilation and its subsequent technical advancement helped manage large numbers of patients with respiratory failure. This branch of medicine evolved much faster in high-income (HIC) than low- and middle-income countries (LMIC). Seventy years later, mankind's encounter with coronavirus disease 2019 (COVID-19) represents another major challenge for critical care medicine especially in LMIC countries where over two thirds of the world population live.

Methods. Systematic analysis of written documents related to the establishment of the first multidisciplinary medical intensive care unit (MICU) in Bosnia and Herzegovina and its development to the present day.

Results. We describe the experience of setting up a modern critical care program under LMIC constraints as a promising way forward to meet the increased worldwide demand for critical care. Successful development is contingent on formal education and continued mentorship from HIC, establishment of a multidisciplinary team, the support from local health care authorities, development of a formal subspecialty training, academic faculty development, and research. Novel

technologies including tele-education provide additional opportunities for rapid development and dissemination of critical care medicine programs in LMIC.

Conclusion. Critical care medicine is a critical public health need in HIC and LMIC alike. The challenges associated with the coronavirus pandemic should serve as a wakeup call for rapid development of critical care programs around the world.

Keywords

Critical care medicine · Low-middle-income countries · Development · Intensive care medicine · COVID-19

Erfolgreiche Implementierung moderner intensivmedizinischer Versorgung im ressourcenarmen Land Bosnien-Herzegowina. Erfahrungen aus einem Zentrum

Zusammenfassung

Hintergrund. Die Intensivmedizin ist eine relativ junge Disziplin, sie entstand Mitte der 1950er-Jahre als Reaktion auf einen Poliomyelitisausbruch. Dank der breiten Anwendung der maschinellen Beatmung und der anschließenden technischen Weiterentwicklung gelang es, eine große Anzahl von Patienten mit Ateminsuffizienz zu behandeln. Dieser Zweig der Medizin entwickelte sich in Ländern mit hohem Einkommen („high income countries“, HIC) viel schneller als in Ländern mit niedrigem und mittlerem („low- and middle-income countries“, LMIC). Siebzig Jahre später stellt die Begegnung der Menschheit mit der Erkrankung durch das Coronavirus (COVID-19) eine weitere große Herausforderung für die Intensivmedizin dar, insbesondere in LMIC-Ländern, in denen mehr zwei Drittel der Weltbevölkerung leben.

Methoden. Systematische Analyse von schriftlichen Dokumenten im Zusammenhang mit der Einrichtung der ersten multidisziplinären medizinischen Intensivstation (MICU) in Bosnien-Herzegowina und ihrer Entwicklung bis zum heutigen Tag.

Ergebnisse. Wir beschreiben unsere Erfahrungen beim Aufbau eines modernen Intensivmedizinprogramms unter LMIC-Bedingungen als einen vielversprechenden Weg, um den weltweit steigenden Bedarf an intensivmedizinischer Versorgung zu decken. Die erfolgreiche weitere Etablierung hängt ab von der formalen Ausbildung und einem kontinuierlichen Mentoring durch das HIC, dem Aufbau eines multidisziplinären Teams, der Unterstützung durch die regionalen Gesundheitseinrichtungen, der Implementierung einer strukturierten Weiterbildung,

der Forschung und dem Aufbau eines akademischen Dozententeams. Innovative Technologien, wie z.B. die Teleausbildung, eröffnen zusätzliche Möglichkeiten für eine schnelle Entwicklung und Verbreitung der Intensivmedizin in LMIC.

Schlussfolgerung. In HIC wie in LMIC zählt die Intensivmedizin zu den entscheidenden Public-Health-Bedarfen. Die mit der Coronavirus-Pandemie verbundenen Herausforderungen sollten daher wahrgenommen werden als ein Weckruf für die rasche Entwicklung der intensivmedizinischen Versorgung weltweit.

Schlüsselwörter

Intensivmedizinische Versorgung · Staaten mit niedrigem und mittlerem Einkommen · Entwicklung · Intensivmedizin · COVID-19

first 2 years the continuity of workflow was maintained with the support of additional anesthesiologists from the SICU who shared night call responsibility. After 2 years, the new team of young physicians completely took over the MICU.

- Space—the first MICU consisted of three patient rooms with the capacity for treating 8 medical critically ill patients.

Over the next 10 years MICU moved to the newly built hospital wing with staff expansion to 20 physicians (8 critical care specialists) and 54 nurses. The primary specialties of these physicians include pulmonology (9 physicians), internal medicine (8 physicians), anesthesiology (1 physician), neurology (1 physician), and infectious diseases (1 physician).

The new space and equipment allow admission and treatment of up to 24 critically ill patients, with provision of full support to all organ systems including high-flow oxygen, noninvasive and invasive ventilators, veno-venous extracorporeal membrane oxygenation (vvECMO), inhaled of nitric oxide (iNO), targeted temperature management, and continuous renal replacement

therapy. At present, this MICU is the only level III MICU in B&H.

Suggestions for other LMIC settings

Parallel to sending physicians and nurses to critical care training abroad it is necessary to develop a clear strategy for staff development in the next 5 years, as well as define project for preparation of space and equipment procurement for treatment of medical critically ill patients. All these activities need to be supported continuously by key stakeholders (Ministry of Health, University Hospital management) at the local community where political influence is crucial. Identification of junior physicians interested in critical care from different primary specialties is particularly useful for the success of future multidisciplinary MICU.

Continuous critical care education locally

During the first few years after the establishment of MICU, continuous critical care education was provided for all young physicians and nursing staff. Educators were local and foreign physicians (officially trained in critical care medicine) with the support of international organizations (The French Society of Intensive Care Medicine, Société de Réanimation de Langue Française; American Society of Critical Care Medicine, SCCM; Bosnian American Academy of Arts and Sciences, BHAAAS). Furthermore, B&H hosted its first SCCM Fundamentals of Critical Care Support (FCCS) course. In addition to close cooperation with mentors, the local physicians expanded communication and collaboration with critical care physicians and nurses from neighboring countries in which critical care medicine programs had already been developed (Slovenia and Croatia). Links with critical care physicians and nurses has grown stronger with time and has enabled transfer of practical critical care skills and knowledge to UCC RS Banja Luka. This was particularly important for nursing training. This variety of programs served as a nidus for developing a formal critical care medicine

specialist training program in Republika Srpska (B&H).

Suggestions for other LMIC settings

The process of developing new, complex medical discipline such as critical care needs to be supported by various forms of continuous medical education that can serve as a bridge to establishing formal subspecialty training program in critical care. This type of education should be led by physicians with formal training in critical care medicine from abroad. It is important to take advantage of cooperation with international organizations that support critical care medicine development, as well as forming a network with critical care physicians and nurses from neighboring countries where development of critical care medicine is further developed. Exchange of physicians and nurses should ideally be in both directions (from learning to a teaching institution and vice versa).

Official critical care education—establishing formal subspecialty training in critical care medicine

During the first few years, the physician educated abroad along with his mentors proposed the first critical care medicine curriculum for physicians from Republika Srpska (B&H). Education in intensive care medicine developed heterogeneously from one country to another, leading to diversity in access, structures, assessment, accreditation, and regulation of trainings between countries. The model chosen in Republika Srpska (B&H) is the subspecialty model, which permits multidisciplinary access from a range of primary specialties (e.g., pulmonary, internal medicine, neurology, infectious diseases) to a common critical care medicine subspecialty training program. The local curriculum was adapted from the European Society of Intensive Care Medicine CoBaTrICE (Competency-Based Training Programme in Intensive Care Medicine for Europe) program. Four years after the first proposal had been made, the Ministry of Health

and Medical Faculty of the University of Banja Luka formally recognized this program and adopted legislation in support of critical care subspecialty training. The physician who was educated abroad became the first critical care fellow in the Republika Srpska (B&H), and two years after he became the first formally trained critical care subspecialist. Medical faculty of the University of Banja Luka recognized foreign mentors with whom MICU physicians collaborated as visiting professors and allowed their inclusion as a faculty for the final board exam (certified specialist board exam). In September 2016, the first critical care board exam was conducted with international faculty (two members from the USA by video link), one member from Germany, one member from Croatia and one local member.

Suggestions for other LMIC settings

In the early stages of implementing critical care medicine program into it is necessary to rely on various informal continuous medical education with simultaneous development of formal curriculum proposal for an ongoing staff education. Subspecialty training from different primary disciplines allows for establishment of a diverse multidisciplinary team, each member bringing different strengths. Again, support from local health authorities (University Hospital Management, Medical Faculty and Ministry of Health) is crucial.

The role of tele-education

One of the forms of education which was incorporated into critical care education system of RS (B&H) was the Mayo Clinic tele-education program which lasted for 3 years. Weekly 45-min, case-based remote learning sessions utilizing the CERTAIN platform were effectively implemented into the MICU practice and were associated with the high staff engagement and satisfaction, improvement in structure, processes, clinical outcomes, and reduced costs. The intervention was associated with reduction

Table 1 Suggestions for low-and-middle income countries (LMIC)

Clearly define local health authorities and other key stakeholders (e.g., University Hospitals, Ministries of Health, Medical Faculties) which need to initiate, and then support the development and implementation of modern critical care medicine. Without political support of local institutions, critical care medicine development will not be possible
Support from HIC university centers (from abroad) where a critical care medicine education program is highly developed with teaching staff who has interest and experience in developing health care programs in LMIC
Long-term mentorship is critical for successful development. Expat physicians proficient in local language and familiar with local customs, culture and politics often have interest in supporting the development of the new discipline in their home country
Exchange of physicians and nurses should ideally be in both directions (from learning to a teaching institution and vice versa). Networking with a neighboring countries where development of critical care has come further along makes this exchange more efficient
Various types of continuous medical education can be used as a bridge to developing a formal subspecialty training program
LMIC should take advantage of novel critical care tele-education programs that can provide more efficient knowledge translation
Academic development should encompass all three shields of medical science: clinical practice, education and research. This will enable sustainable staffing by trained clinicians and will provide answers to many questions related to care and outcomes of critically ill patients in LMIC

HIC high-income countries

in mortality, length of stay, and marked cost savings (\$400,000 over 2 years) [18].

Low-cost tele-education interventions can serve as an efficient model for educat-

ing health workers and improving care and outcomes of critically ill patients in LMIC.

Suggestions for other LMIC settings

Developing critical care programs in LMIC should strongly consider participating in low cost critical care tele-education projects such as the Mayo Clinic CERTAIN (www.icertain.org) that can help speed up knowledge transfer in more efficient manner.

Role of local health care authorities

The management of UCCRS had a central role in developing critical care program first by supporting education abroad, working with the Ministry of Health of RS to establish the first MICU, and the subsequent formal critical care training program. In the following 10 years, limited MICU capable of caring for only few critically ill patients has grown into a regionally recognized, high-performing MICU. Today, this MICU is ISO 9001 certified as health provision service and critical care education and has

Hier steht eine Anzeige.

become a tertiary referral center for the treatment of medical critically ill patients. It is important to point out that throughout the 10-year development of critical care medicine in the UCC RS Banja Luka, there was support of key institutional stakeholders.

Suggestions for other LMIC settings

Introduction of new medical discipline, especially in LMIC often faces significant obstacles and resistance hence collaboration and support of key institutional stakeholders is absolute necessity for providing necessary practical, financial, and political support. Without collaboration of key stakeholders, implementation of new branch of medicine into health and educational system of one country cannot succeed. Growth and development of the critical care in the UCC RS was supported by all relevant institutions, first of all leadership of UCC RS management, Ministry of Health RS, and Medical Faculty.

Treatment of critically ill, education and research in the field of critical care—the circle is closed

Critical care program in UCC RS has matured with established conditions for continued staff education. In parallel with education and training, MICU UCC RS has rapidly engaged in critical care research including formal PhD studies in the field which served as an additional incentive for junior clinicians interested in critical care. To date three doctors achieved a PhD degree with two additional PhD candidates. During the coronavirus pandemic, the MICU staff spearheaded rapid development of critical care programs in three regional hospitals in Republika Srpska (B&H). Ideally, development of critical care programs should be coupled by simultaneous development of modern prehospital emergency transports and hospital emergency departments which should be one of the highest priorities towards further improvements in care and outcomes of critically ill patients.

Suggestions for other LMIC settings

Without simultaneous development of all three shields of medical science (clinical practice, education and research) development process of any new medical discipline, including critical care, will not be successful. Again, the support of all stakeholders including medical school and research institutions is crucial.

Conclusion

Critical care medicine is a major public health need of all communities, in HIC and LMIC alike. The great challenge of the coronavirus pandemic should serve as a wakeup call for rapid development of critical care programs around the world. One of benefits that should arise from this pandemic is a more rapid implementation of critical care medicine programs in LMICs. It is important to emphasize that trained staff is far more important than “ICU beds” or equipment. **Table 1** provides the key suggestions and recommendations for rapidly developing and implementing critical care medicine programs in LMICs. Ideally, development of critical care programs should be coupled by simultaneous development of modern prehospital emergency transport and hospital emergency departments. HICs in Europe are moving toward critical care medicine harmonization with the main goal of standardizing critical care practice. LMICs have to follow this pathway without delay to include modern multidisciplinary, evidence-based critical care medicine into their health care systems.

Corresponding address

Prof. Dr. P. Kovacevic
Medical Intensive Care Unit, University Clinical Centre of Republic of Srpska and Medical School of Banja Luka
Dvanaest beba bb, 78000 Banja Luka, Bosnia and Herzegovina
peko051@yahoo.com

Compliance with ethical guidelines

Conflict of interest. P. Kovacevic, F. J. Meyer and O. Gajic declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All studies performed were in accordance with the ethical standards indicated in each case.

References

Cited Literature

- Lassen HCA (1953) A preliminary report on the 1952 epidemic of poliomyelitis in Copenhagen with special reference to the treatment of acute respiratory insufficiency. *Lancet* 1:37–41
- Reisner-Sénélar L (2011) The birth of intensive care medicine: Bjorn Ibsen's records. *Intensive Care Med* 37:1084–1086
- Tang W, Sun SMH (2011) (Hal) Weil—a leader, mentor, friend, and wonderful colleague. *Resuscitation* 82:1481–1482
- Vukoja M, Riviello ED, Schultz MJ (2018) Critical care outcomes in resource-limited settings. *Curr Opin Crit Care* 24(5):421–427
- Phua J, Weng L, Ling L et al (2020) Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations. *Lancet Respir Med* 8(5):506–517
- Turner HC, Hao NV, Yacoub S et al (2019) Achieving affordable critical care in low-income and middle-income countries. *BMJ Glob Health* 4:e1675
- Bauer J, Brüggemann D, Klingelhöfer D et al (2020) Access to intensive care in 14 European countries: a spatial analysis of intensive care need and capacity in the light of COVID-19. *Intensive Care Med*. <https://doi.org/10.1007/s00134-020-06229-6>
- Adhikari NKJ, Fowler RA, Bhagwanjee S et al (2010) Critical care and the global burden of critical illness in adults. *Lancet* 376:1339–1346
- Dondorp AM, Iyer SS, Schultz MJ (2016) Critical care in resource-restricted settings. *JAMA* 315:753–754
- Schultz MJ, Dunser MW, Dondorp AM et al (2017) Current challenges in the management of sepsis in ICUs in resource-poor settings and suggestions for the future. *Intensive Care Med* 43:612–624
- Murthy S, Leligdowicz A, Adhikari NKJ (2015) Intensive care unit capacity in low-income countries: a systematic review. *PLoS ONE* 10:e116949
- Baelani I, Jochberger S, Laimer T et al (2011) Availability of critical care resources to treat patients with severe sepsis or septic shock in Africa: a self-reported, continent-wide survey of anaesthesia providers. *Crit Care* 15. <https://doi.org/10.1186/cc9410>
- Dieleman J, Campbell M, Chapin A et al (2017) Evolution and patterns of global health financing 1995–2014: development assistance for health, and government, prepaid private, and out-of-pocket health spending in 184 countries. *Lancet* 389:1981–2004
- Rhodes A, Ferdinande P, Flaatten H et al (2012) The variability of critical care bed numbers in Europe. *Intensive Care Med* 38:1647–1653

15. Simunović VJ (2007) Health care in Bosnia and Herzegovina before, during, and after 1992–1995 war: a personal testimony. *Confl Health* 1:7
16. Thiéry G, Kovacević P, Straus S, Vidović J, Iglica A, Festic E, Gajic O (2009) From mechanical ventilation to intensive care medicine: a challenge for Bosnia and Herzegovina. *Bosn J Basic Med Sci* 9(Suppl 1):69–76
17. Öhler H, Negre M, Smets L, Massari R, Bogetić Ž (2019) Putting your money where your mouth is: Geographic targeting of World Bank projects to the bottom 40 percent. *PLoS One* 14(6):e218671
18. Kovacevic P, Dragic S, Kovacevic T et al (2019) Impact of weekly case-based tele-education on quality of care in a limited resource medical intensive care unit. *Crit Care* 23:220

Further Reading

19. Lang TA, White NJ, Hien TT et al (2010) Clinical research in resource-limited settings: enhancing research capacity and working together to make trials less complicated. *PLoS Negl Trop Dis* 4:e619



Trainieren Sie EKG-Befundung mit dem Intensivkurs EKG

Der Intensivkurs enthält:

- 108 EKGs zu den wichtigsten Herzerkrankungen
- Trainieren in 3 Schwierigkeitsstufen
- Fallbasiert, spielerisch, praxisorientiert
- Ausführliche Kommentare vom Experten PD Dr. Carsten Israel
- Auch als Facharzt-Training App

Zugang mit einem kostenpflichtigen e.Med-Abo.

➤ Mit Scan des QR-Codes zu allen Trainingskursen



www.springermedizin.de/facharzttraining

