Biannual Publication of the Emergency Care Society of South Africa

SANGUINE

Technology in Emergency Care

12-Lead ECGs and Reperfusion Time

Open Educational Resources in Emergency Care

Technology in Simulation

Volume 5, Issue 1 | **January** - **June 2015**

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EDITORIAL

Staying abreast with the latest technology is sometimes far easier said than done. Innovative technology and resources pop up daily, changing the way we view the world, our social context and even the way we learn. YouTube for example, founded in February 2005, has changed how people access and share experiences and information. and with the advent of electronic learning coupled with the information giants such as Google, Youtube, Facebook and even Twitter access to information is cheap and plentiful, bau can easily go by unnoticed.

In this issue of *Sanguine* we highlight *technology in medicine* and highlight local emergency care endeavours. Several articles in this addition deal with the looming boom of technology in emergency care both in education and clinical practice. Emergency care education, traditionally composed of stale didactic lectures in the classroom have moved towards blended learning and flipped classrooms and in the education article **open education resources (OER) in emergency care** the authors state the current state of emergency care open access resources in South Africa, highlight local OER champions and provide the context and recommendations for further development. The ECSSA research and development special interest group expand on their ongoing **webinar series 'fundamentals of descriptive research'** in the special interest group section.

Twitter, viewed by some as a tool to post pictures of your breakfast, has evolved quite rapidly as a recognised platform to disseminate knowledge, education and staying abreast with the latest developments in your discipline. Students can now interact directly with leaders in emergency care and even interact directly fostering international connections instantly, a previously impossible concept. In our **interview with Mihn le Cong**, an emergency medicine Twitter giant, we pick his brain on what his current in emergency medicine and try to find out what makes him tick so furiously.

High-fidelity simulators has become more common in emergency education and is considered to improve students outcomes compared to standard models. In our education article **'low-cost high relevance simulation in clinical skills acquisition: is it about technology?'** the authors further unpack the pedagogy of simulation and propose a different paradigm and thinking approach to simulation assessment. Linking with the theme of technology, we take a step back to everyday life in our opinion piece **'the paradox with technology'** and explore whether technology truly does make life easier - I for one wish email would disappear completely (for some peace and quiet)!

Adverse event reporting and the beneficial effect of doing so is seldom highlighted as practitioners mostly associate these indicators with shortening one's emergency career indefinitely. We present a recent case study where adverse event reporting resulted in some unexpected benefits and organizational insights.

Kind regards,
Michael McCaul
Editor
Sanguine

The team are excited to present the July issue of *Sanguine* and hope you enjoy the content. We would welcome and encourage letters to the editor striking up conversation, debate or comments on relevant emergency care topics.

Please contact our communication officer for any input, comments, letters or queries at communication@ecssa.co.za

Sanguine:
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Sanguine publishes newsworthy and professionally relevant articles of interest to all healthcare professionals working in the field of pre-hospital emergency care. The views expressed in Sanguine are not necessarily those of the Editor or ECSSA. Information related to the clinical assessment, diagnosis or treatment published in Sanguine should not be regarded as any form of guideline unless explicitly dentified as such.

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COLLEGE OF PARAMEDICS NATIONAL CONFERENCE 2014: URGENT AND EMERGENCY CARE – UNLOCKING THE POTENTIAL OF THE PARAMEDIC PROFESSION

Raveen Naidoo

College of Paramedics

The College of Paramedics (COP) is the recognized professional body for Paramedics and the ambulance profession in the United Kingdom. COP held its national conference at the University of Warwick on the 6th and 7th October 2014. As part of the speaker exchange programme, I attended and presented a paper entitled "Harmonizing Education, Practice Protocols and Professional Regulations of Emergency Care in South Africa." and continued engagement for internationalization of ECSSA and South African Emergency Medical Services with colleagues around the globe.

The COP conference was well attended by delegates from within United Kingdom and the immediate surrounding countries. It soon became clear to me that while the COP intended for the conference as a national one, the conference had attracted delegates from far and wide - Canada, USA, Australia, Switzerland, Austria and others. Another striking observation was the dress code for all UK attendees. Unlike my experiences with EMS conferences elsewhere, most British paramedics attending dressed formally, if not in a full suit then most certainly with a formal shirt and tie - something that they did with pride!

The papers presented at the conference were varied and while most were oriented towards UK EMS, there were several papers from other parts of the world as well. Prof Andy Newton, the Chair of the College of Paramedics gave an interesting talk on the growth and development of Paramedic specialities within the UK. While there are several titles of practice, which are linked to the various employing organizations, there is only one registration of Paramedic. Depending on their job profiles, UK has categories called, Critical Care Paramedics, Consultant Paramedics, Research Paramedics and Advanced Paramedics.

Thoughts and reflections

I gathered from this trip that most established EMS settings in the world are reviewing their systems with the primary focus being on what is the best for the patient that is backed up by evidence. The review of education, regulations, protocols etc. in South Africa that we are currently engaged in, is also taking place in other developed EMS in the world. In many instances, it would appear, that we are ahead in several aspects. We must continue to collaborate with our international colleagues to share information and best practice since the challenges we face are similar.

With there being an increasing number of EMS providers engaging in postgraduate studies, there is an immense opportunity for research collaboration as well. These efforts will foster as sense of togetherness amongst prehospital providers and firmly establish our place in the international EMS arena.

Acknowledgments

Appreciation and gratitude is conveyed to Mr Martin Berry and the College of Paramedics who welcomed and hosted me during my stay in Coventry. I am grateful to ECSSA, as well, for the opportunity to represent the organization at this international platform.

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USING TECHNOLOGY TO FACILITATE SAFER PATIENT CARE : ONLINE ADVERSE EVENT REPORTING AT ER24

Craig Wylie
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Scenario...

An ambulance crew was doing a transfer of a ventilated patient from one ICU to another. After the patient was stabilised on the transport ventilator, he was moved from the ICU to the ambulance using a portable oxygen cylinder. When the crew they attempted to plug the oxygen into the main wall oxygen in the ambulance an alarm was triggered: "low pressure". After significant attempts at fault finding, the problem remained unresolved. This necessitated that the patient be ventilated using additional portable oxygen cylinders. The incident was reported to the local EMS manager. Within 24 hours the manager investigated the event, only to find that a factory fault was to blame. In this brand new ambulance, the high pressure hose system was attached to a low pressure valve. This was immediately corrected by him at almost no cost.

Adverse event reporting is the cornerstone of a patient safety culture. It is imperative that organisational learning occurs from medical error. A well-designed reporting system allows for investigation and organisational improvement to embrace a patient safety culture and prevent adverse events from reoccurring or from near-miss events from becoming adverse events. ER24, a South African private emergency medical service initiated principles of adverse event reporting in an attempt to create a safer environment for both patient and practitioner.

Definitions

In patient safety literature and discussions there are certain key concepts and "buzz words" that you will hear repeatedly. These words are:

- **Adverse events** - Injuries related to medical management, not complications of disease. Medical management includes all aspects of care, including diagnosis and treatment, failure to diagnose or treat, and the systems and equipment used to deliver care. Adverse events may be preventable or non-preventable.
- **Near-miss events** - Serious errors or mishaps that had the potential to cause an adverse event but fails to do so because of chance or because they are intercepted.
- **JUST Culture** - A concept surrounding creating an atmosphere of trust, encouraging people to provide essential safety related information on adverse events and near-misses. This is done under the premise that errors are often system failures rather than individual failure. The focus is on understanding the root of the problem. This allows for overall improvement more effectively than disciplining the individual practitioner involved, however the concept does not disregard accountable as willful violations are not tolerated.

Accessibility to the reporting system

Despite accepting that emergency medical care is not a benign practice, there appears to be under-reporting of adverse events and near-misses. One of the reasons for this that ER24 identified, was the problem of access to the reporting systems. It was assumed that if the emergency care personnel did not have easy access to the reporting systems, they probably will not make an extra effort to report an adverse event. When considering the widespread use and increasing access to smartphones, and the mobile nature of the EMS work environment, ER24 made the decision to employ a web-based reporting form. This form is accessible from both a personal computer and a smartphone. After ER24 communicated the URL of the online form, a significant increase in the number of events reported was appreciable.

The investigation of events

Investigation of events has to keep

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the Just culture in mind. At ER24 we place emphasis on the fact that adverse event investigation is done in a non-punitive fashion. This is important to ensure the sustainability of our reporting system.

Giving feedback

Another important factor in the sustainability of the reporting system has been giving individual feedback to the person/practitioner that reports the event. The staff member firstly appreciates that someone listened to their concern/s and secondly where possible they are personally able to initiate a series of events which can result in positive change to their working environment. Both of these in turn, promote a reporting culture within the operations.

After fixing the problem the local EMS manager decided to report this event to the online self-reporting system. On an organisational level it was decided to investigate the circumstances surrounding the actual event. After doing a root-cause analysis it was found that the high pressure house was connected to the low pressure fitting at an ambulance conversion level. The investigation was followed by a national organisational-wide observation which was done by all the local EMS managers and reported to the national manager. It was found that throughout the organisation there were about 25 of these oxygen gauges that were connected incorrectly. By identifying these units were able to prevent at least 25 possible serious adverse events to future patients and in so doing create a better patient safety environment.

Craig Wylie is the Clinical Governance Manager for ER24.

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SOCIAL MEDIA AND MEDICINE: AN INTERVIEW WITH MIHN LE CONG

Jocelyn Park-Ross

If his twitter account is anything to go by, Mihn le Cong never sleeps. He is a retrievals doctor and 'medical macGyver' working in rural Queensland with the Royal Flying Doctor Service, as well as providing their clinical governance and course co-ordinator. He is also the course co-ordinator for the Bond University Retrieval medicine program. In his spare time he runs the PHARM blog and podcast. He took a few minutes out to talk to Sanguine about his passion for social media and medicine, and where the two meet.

Sanguine: What is FOAMed and why is it important?

le Cong: Free Open Access Medical Education is the term coined by Dr Mike Cadogan of Life in the Fast Lane blog site, one of the first and most well renowned FOAMEd site. We are a movement, an idea. The concept is to provide free, unrestricted medical education content that is created and refined by the users, thus avoiding copyright issues. The vehicle to disseminate the content is online platforms like blogsites and podcasts with promotion via social media outlets like Facebook, Twitter and Google+. It is important because it allows many like minded educators from around the globe to interact, create and publish content , who otherwise would be duplicating material and ideas in silos. The open access element allows all levels of users to participate, provide feedback and review content.

Sanguine: How did FOAMed start?

le Cong: Its origins go back at least 10 yrs with individuals writing blog sites about various medical education content, however it became a united movement online in 2012 when Dr Cadogan, coined the term FOAM after staring at a pint of Guinness in a pub in Ireland, during the ICEM conference he was giving a talk on Social Media in medicine.

Sanguine: How is the content and quality of information controlled?

le Cong: It is truly a free movement so there is no single governing body or society that sets nor monitors standards. The content and quality can vary greatly and is driven by the interests and passions of the individual creators. Over the last 3 years, some online groups of authors have amalgamated and have set their own site standards of peer review and conduct of authorship. Notably sites like Academic Life in Emergency Medicine have not only set their own publication standards but have conducted online research into quality control in FOAM . The greatest criticism of FOAM is the quality control and lack of defined standards. Having said that, the quality can be of the highest standard and the creative element has allowed for some extremely impactful education material made available to the public for free.

Sanguine: What advice would you give to a FOAMed newbie?

le Cong: Read widely, follow everyone but still listen to your teachers and colleagues who you study and work with. FOAMEd is just another source of information. It doesn't replace traditional learning and teaching. I have used it to improve my ultrasound skills and knowledge, my emergency airway management and anaesthesia, to understand how others around the globe work to solve the same problems I face but in different settings. It keeps me inspired to learn and to connect. But I still do traditional teaching and research . I still write papers and submit them to traditional journals. I still attend traditional medical conferences and sit in on lectures.

FOAMEd allows me to be a more complete learner cause my teachers are from across the globe.

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AFRICAN SOLUTIONS TO AFRICAN PROBLEMS: AN INTERVIEW WITH STEVAN BRUIJN

Stevan Bruijns is the co-editor-in-chief of the African Journal of Emergency Medicine, the journal of the African Federation of Emergency Medicine, an open access journal focused on developing African Emergency Medicine. This international, peer-review journal even provides authors with an author assist program, making it easier for first time authors to publish quality work. Stevan is also a senior lecturer int the University of Cape Town Emergency Medicine department.

Sanguine: What motivated you to get involved in AJFEM?

Bruijns: I enjoy research sure enough, but I enjoy a challenge more. I knew it wasn't going to be easy, but I also knew the team we got together to start the journal up and that made the decision easier. In my mind I pictured a situation where Africa could take care of Africa's own problems. This was essentially embodied in the very first editorial I wrote for the journal: Africa should be taking responsibility for emergency medicine in Africa (http://www.sciencedirect.com/science/article/pii/S2211419X11000115). Did you know we'll be five years old in December?

Sanguine: Why does Africa need their own journal?

Bruijns: African emergency medicine is different for one big reason: resources. Sure there are pockets of excellence, but these are easily drowned out by a sea of no kit, no drugs, no staff, no roads, etc. Sadly we see very little research addressing this in international literature. Probably because international literature are written for the fortunate 15% who happen to live in high income countries. You are free to read the big international emergency medicine journals, but you won't find much application for a large proportion of the content in the majority of African settings. It is our aim to specifically address this niche field of providing quality emergency care within resource restricted settings and we want to focus specifically on the second-most-populous continent in the world. This also embodies the values of our parent society, the African Federation for Emergency Medicine, to a large extent.

Sanguine: What is your favourite example of an African solution to an African problem?

Bruijns: We recently launched a resource innovation competition and were blown away by the quality of the entries. I would definitely pick my favourites from this competition: using saline soaked cotton wool as electrodes for performing three-lead ECG. All the credit goes to the emergency care nurse from Ghana, Emmanuel Acheampong. That said we still lack African solutions to the bigger issues, such as, how to address the fall-out from the rising burden of non-communicable diseases and injuries. As African emergency care researchers, we should just be trying to replicate Western solutions to problems, but rather should be thinking outside the box and finding novel solutions. There was a great study recently where the author tried to come up with a clinical decision rule to differentiate between ischaemic and haemorrhagic stroke since they do not have ready access to CT scanning. It didn't work however, that is not the point. This researcher has started to think outside the box. We need more researchers like him in Africa

For more information about AfJEM: http://www.afjem.org

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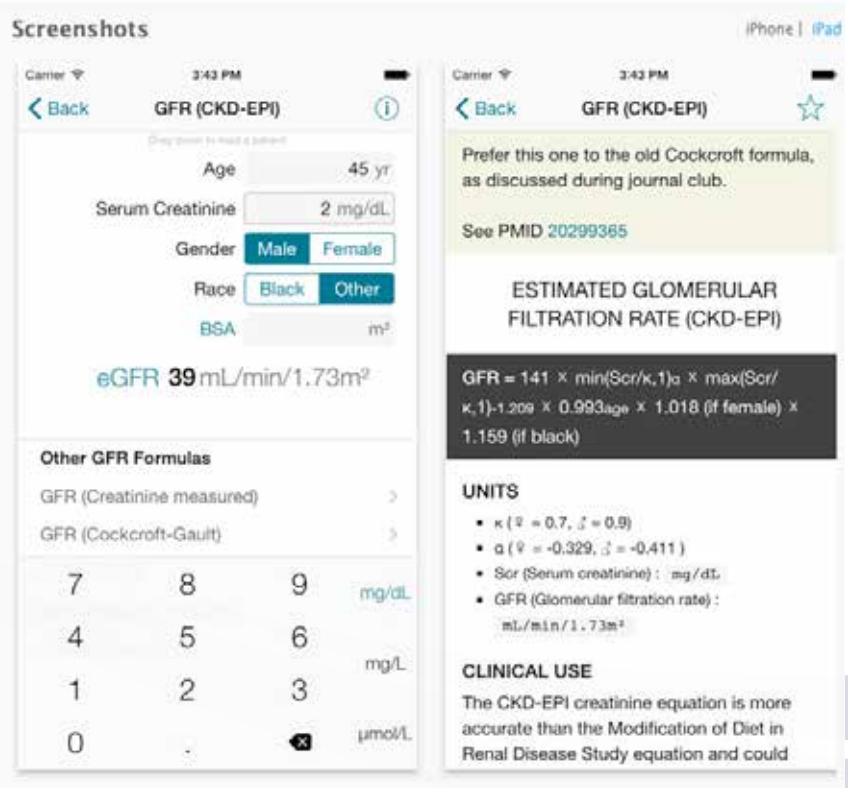
GUIDE TO APPS

A QUICK GUIDE TO APPS, BLOGS AND EVERYTHING IN-BETWEEN IN EMERGENCY MEDICINE

Whether it is a quick reference app or educational resources you are looking for, your phone or laptop is all you need. Between phone apps and the FOAMed movement, the days of raiding your savings account for heavy textbooks are long gone. The FOAMed revolution in Emergency Medicine education provides easy access, free content: from conference highlights to the latest literature to debates on hot topics, and it's all on your phone.

1. MedCalc

MedCalc is an excellent quick reference app for a large variety of medical calculations that we no longer need to commit to memory, from Ballard scores to fluid replacement for peadiatrics and neonates to a-A gradients and a pregnancy wheel.



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2. EMGuidance

http://www.openmedicineproject.org/photo-gallery/emergency-medicine-guidance-app/

A proudly South African production, EMGuidance incorporates the Emergency Medicine Guidelines of the Western Cape into a quick reference app for adult, pediatric and pre-hospital services. The app includes a synopsis of the signs and symptoms, treatment and action plans for a large variety of common emergency presentations, and is made even better by the fact that it is focused on common patients in a South African context.

3. SmartFOAM

SmartFOAM collates FOAMed content from twitter and blogs onto an app for your quick viewing pleasure, making everything more accessible, from case studies to big news in the emergency medicine world.

4. NeoMate

NeoMate, based upon the United Kingdom national standards and the drug formulary of the Neonatal Transfer Service in London, United Kingdom is not something you want to be caught without in a neonatal emergency. After you have entered the weight of the patient, the app will calculate a variety of aspects of your resuscitation, from drugs to intravenous fluids to endotracheal tubes to central line sizes.There are also checklists for a few clinical conditions, such as acute deterioration of a ventilated baby. Don't be caught without it.

5. The most useful app of all time: Twitter.

The person who introduced me to twitter explained to me that Twitter is for medical education, and Facebook was for posting pictures of her dogs. I have learnt more from my twitter feed in the past two years than I have anywhere else (including my masters course). The best advice: be selective who you follow, keep it as an educational resource and engage with the people you are following: join debates, ask questions - this is what twitter is for! One of the great advantages of twitter are the conferences: you will get to read the highlights and top points from conferences the world over for free.

A good starting point is to follow the authors of the podcasts or blogs you like, and have a look at some of the African 'legends of twitter' in the link below. Take note also of the links to the free open access journals:

http://badem.co.za/foamed/

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Podcasts and blogs

Podcasts are an excellent educational tool, and are accompanied by a blog post with further reading and resources. Posts range from the latest in evidence based emergency medicine to videos of how to do procedures, and everything inbetween. Often the most interesting part of the blog posts is the comments section.

St Emlyn's

http://www.stemlyns.org.uk

St Emlyns is a virtual hospital, and an educational blog. Within the hospital are educational cases from Emergency Unit to Pediatrics to Intensive Care Unit. The cases include CT scans, nursing notes, questions and reviews of the case. The podcasts are of particular value, covering a broad range of topics with experts in the field covered.

badEM - Brave African Discussions in Emergency Medicine

http://badem.co.za

The first South African Emergency Medicine blog, badEM is run by South African doctors and paramedics showcasing the 'special uniqueness' of emergency medicine in Africa. Recently launched, badEM focuses on innovations in low resource settings and African solutions to African problems. The quick and simple clinical focus posts, events page and skill videos are great resources for any health care practitioner and students, from both the blog team and guest authors. Check out the five post series on the winners of the AfJEM innovation competition, a super vital post about handover etiquette and an alternative use for condoms - it's not what you think! badEM can be found on facebook, twitter or follow the link to their blog above.

EMCrit

EMCrit

http://emcrit.org

EMCRIT is without a doubt one of the top blogs out there, with a variety of the top doctors, paramedics and nurses focusing on all things emergency medicine and critical care, with a passionate focus on combining intensive care strategies with emergency medicine: 'bringing upstairs care downstairs' is their tag-line. The 'deep dive' section is great for students wanting to understand a topic in-depth, and there is also a 'learn to FOAM' section. Don't miss: Scott's take on a surgical airway (the cricon podcast)

PHARM - Pre-hospital and Retrieval Medicine

http://prehospitalmed.com/welcome-from-minh/

Mihn le Cong, a flight doctor from Australia, has a special interest in pre-hospital and retrieval medicine. His podcasts topics discuss a variety of pre-hospital and emergency medicine topics, and are relatable to a South African context as he has great experience working in rural environments with few resources. He is a great advocate for ketamine and particularly focused on airway related issues. Best podcast so far: Why Roc rocks and Sux sucks.

LIFE IN THE FASTLANE

Life in the Fast Lane

http://staging.lifeinthefastlane.com

Life in the Fastlane is one of the bigger blogs, and includes many many global experts as contributors, touching on topics from all corners of emergency medicine and critical care. Run by a collection of Australasian critical care physicians and nurses claiming the blog was created 'out of an intense desire to procrastinate' and 'passionate (and usually unresolved) debate'. They have a great video and post about the creation of the FOAMed movement, and probably anything else you can think of.

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Emergency Medicine Kenya

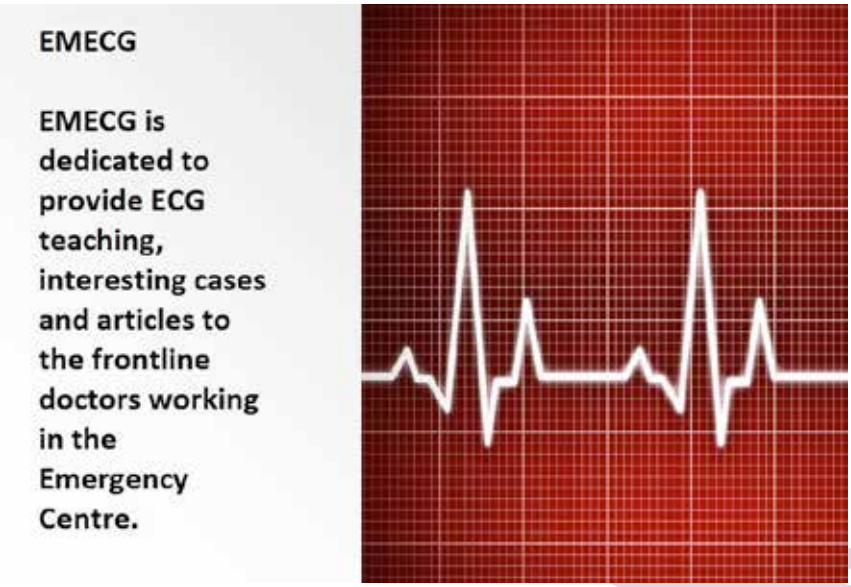
http://www.emergencymedicinekenya.org

Proudly African, Emergency Medicine Kenya was started by three Kenyan Emergency Medicine doctors in January 2015. Aiming to further education and research in emergency care in Kenya and other low-resource settings, the blog also has a strong Facebook presence making their posts more accessible and wide spread amongst their target audience.

Emergency Medicine Uganda

http://www.emergencymedicineuganda.com

Emergency Medicine Uganda is a blog run by a collection of passionate doctors who are dedicated to promoting and developing Emergency Medicine in Uganda. The blog maps the growth of emergency medicine and disaster medicine, demonstrating the 'African solutions for African problems' in a truly inspirational spirit. To quote one of their posts: "our journey of a thousand steps has just begun".



EMECG

https://www.facebook.com/pages/EMECG/1043588985666778?ref=br_rs

If you are on facebook then this is a page well looking up. The page is run by three Cape Town Emergency Physicians who present ECG's from cases presenting mostly in Cape Town provincial hospitals. The page is interactive with ECG's and case studies being posted, and the author following the readers comments and questions as they venture towards a diagnosis.

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OPINION

TECHNOLOGY IN MEDICINE

Past, Present and a Possible Future – Help or Hinder

Mike Emmerich

Technology in Medicine, a topic many in EMS chat about, and if we have been in service for 20 years plus, we have then been privileged (or cursed) to see significant changes across the board with regard to equipment, patient care, protocols and drug therapies. Many of us have actively pushed for change and new equipment; be it with regard to fluid therapy, bleeding control, pain management and airway management. As one who has been active in certain areas pushing for change, we sometimes miss the most crucial approach to patient care; neatly summed up by Hippocrates (400-ish BC)

Cure Sometimes. Treat Often. Comfort Always

The classic approach to patient care has always been underpinned by the following:

- Arrive at a diagnosis by patient consultation and physical hands on examination
- Confirm ones diagnosis via various diagnostic devices
- Reaffirm ones diagnosis by means of special investigations

Will technology change this approach for better or the worse?

If we look back at history, we see that not all new technologies have been readily accepted by the medical community. Many were viewed (are viewed) with suspicion. In the 1930's some doctors doubted an X-ray image of the chest was as reliable as a physical examination. Devices threatened to replace the diagnostic expertise of the traditional doctor. Many doctors have valued their clinical experience over machine-produced information. Other technologies initially failed because doctors or patients found them impractical. The ECG was only useful when it became portable and reliable enough to be used at the patient's bedside.

We need to also seriously review our progress in Medical Technology with regard to changes that offer only incremental benefits but at much higher patient care cost. The focus must be on evidence-based product development, manufacturers have to be able to show their products and new technologies will add value to their customers. Does new technology automatically translate into better patient care and most importantly improved patient outcomes.Plus we need to ask the question; who is their customer, the patient or the medical practitioner? If we as practitioners treat our patients as customers, they will act like customers, we need to be very careful of venturing into a quagmire such as this.

The entire patient/medical practitioner relationship is also changing, as the patient has access to a wider range of medical information, our patients are possibly smarter *(maybe).* Patients have access to more medical information, with the end result, that at times, they might be less trusting and prone to ask more questions of their medical practitioner. As practitioners we must be open to this new questioning patient and be willing to answer more questions than we did in the past.

Taking cognisance of all of the above: what is the health care practitioner to do?

There is an acknowledged gap in the "bench to bedside" cycle of medical discovery and its implementation in clinical practice, which can mean a gap of years changing "what we know to what we practice".Hence the treatment of patients in an emergency setting should not only be concentrated on developing new technologies, but must also involve proper training and skills development; medical talents needs to be honed. New technologies MUST always mandate new skill sets, protocols and procedures.

An area of import in my opinion in medical development is patient information. The more information we have on the patient at hand, will allow us to render more appropriate patient care. Information and knowledge management is critical in helping

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with the decision making process and thereby improving patient care. Many medical practitioners believe that patients should take an active role in managing their own health information, because it fosters personal responsibility and ownership and enables both the patient and practitioner to track progress outside scheduled appointments and at times of a medical emergency. Patient smart cards is one way to grapple with this issue of information. It will allow patients to upload their health records via a flash drive and carry their information with them in their wallet. Information may be accessed through cloud-based storage and encrypted systems anywhere in the world, or plugged into medical smart readers. Medical practitioners can update to cloud technology in real time and the patients own medical doctor can be alerted to changes in the cloud files.

Another key area where technology can aid us in having more information at our fingertips is via a "differential" diagnosis or problem list, which is accessed via the cloud and links to our patient file and further information we input. After we have reviewed the patient "history" and examination. (e.g. is this appendicitis? a urinary tract infection? constipation? inflammatory bowel disease?) The practitioner must then troll his memory banks and innate knowledge base, or one may need to consult texts/online sources to check up/confirm their thinking. Cloud based technology could aid us and speed up the confirmatory differential diagnosis. As their is no doubt much room for improvement in the current approach, with many practitioners currently relying on their tacit knowledge base at the frontline which, while mostly effective, is subject to human error. Once the differential diagnosis or problem list is drawn up, then a related treatment plan could be formulated, and treatments in the form of procedures and/or prescriptions for medications may be suggested by our cloud database.

Emergency Medicine must continue its current academic trajectory, to keep pace with the challenges that technology brings to our patient care. If academic training lags behind the technology curve our practitioners and therefore our patients will be the poorer. We must ensure that there is now technology/practitioner gap as we continue to push the boundaries in improving our patient care. The danger of technology, is that it has the ability to make us lazy and self reliant. It has become noticeable in certain areas of emergency medicine how our reliance on technology has allowed us to forget the three cornerstones of good medicine, diagnosis, confirmation and reaffirmation; of which the diagnosis and confirmation are reliant on us having a hands on approach to our patients *(which is becoming a dying art).* Good solid diagnostic skills will always be an essential tool of medicine, especially emergency medicine, we forget this at our and our patients peril.

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THE EFFECT OF PREHOSPITAL TWELVE LEAD ELECTROCARDIOGRAPHIC ACQUISITION AND TRANSMISSION ON REPERFUSION TIME

Willem Stassen

A doubling in the burden of cardiovascular disease is predicted by 2020. Many South Africans still do not enjoy equitable access to quality coronary care. In order to reduce mortality, the diagnosis of STEMI should be expedited to the prehospital sphere. The role of 12 lead ECG telemetry in expediting diagnosis and care is discussed.

Introduction

The burden of cardiovascular disease (CVD) is mounting in Sub-Saharan Africa. In 2009, it was considered to be the second most common cause of death after infectious diseases in Sub-Saharan Africa, and its incidence is expected to double by 2020. [(1)] Locally, an increase in CVD as cause of death is appreciable from 13.9% in 2008 to 16.7% in 2013. [(2)] However, many South Africans still do not have the access to healthcare, often due to geographic constraints and disparate resource distribution between the public and private sectors. [(3)] [(4)] Yet, urgent access to medical care is essential in decreasing morbidity and mortality following acute coronary events such as ST-segment elevation myocardial infarction (STEMI). A 7.5% increase in one year mortality risk is appreciable for every 30 minute delay in reperfusion. [(5)] This article aims to review selected pieces of literature to highlight the effect of prehospital 12 lead electrocardiographic (ECG) acquisition and transmission in reducing the reperfusion times in patients presenting with STEMI.

The twelve lead ECG, Telemetry and Stemi

In this section, a quick and over-simplified recap on the ECG and the pathology is presented. The electrocardiograph (ECG) is the recording of the changes in the electrical impulses of the heart over a period of time. The ECG was born in 1887 when Augustus Waller first described that "each beat of the heart is seen to be accompanied by an electrical variation." [(6)] Each one of these electrical variations carry a meaning. The 12 lead ECG views these electrical impulses in 12 different aspects or views of the heart, and can therefore pinpoint where the abnormality is originating from. Telemetry is the act of sending this recording of the ECG via wireless technology, to a clinician who is not with the patient, in order to make sense of the meaning of the electrical impulses – diagnosing the ECG.

Myocardial infarction or heart attack, is the term used to describe the death of the myocardium secondary to decreased or total cessation blood flow and consequent necrosis of the myocardium. This is caused by an atheromatous blockage of the coronary artery. A STEMI is a specific kind of heart attack that presents with a change in the electrical impulses of the ECG that allows us to make the diagnosis quickly. STEMIs in particular need to be managed with extreme urgency in a cardiac catheterisation theatre, where a stent is placed to open up the blood vessels.

The effect of 12 lead ECG Acquisition and Telemetry on reperfusion time

In order to reduce mortality associated with STEMI, it has been suggested to expedite the diagnosis of STEMI to the prehospital setting.

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By doing this, numerous studies have shown decreases in the reperfusion times of STEMI when this approach is taken.

A study published by the University of Copenhagen aimed at establishing whether prehospital telemetry influenced the reperfusion times when compared to matched, historic controls. [7] A total sample of 168 was obtained. In the telemetry group, the emergency call to reperfusion time was 74 minutes, while that of the control group was 127 minutes. In addition, shorter hospital arrival to reperfusion times were appreciable in the telemetry group; 34 minutes versus 97 minutes. [7] These findings were echoed by an American study, which activated the cardiac catheterisation team during the prehospital phase of care, and delivering these patients directly to theatre, bypassing the emergency centre. This intervention showed a 30 minute reduction in the reperfusion times of STEMI patients. [8]

An Italian study published in 2014 prospectively enrolled 297 patients and compared the time of first prehospital STEMI-diagnosis to the reperfusion time between patients who received a prehospital 12 lead ECG and telemetry with those who were simply transferred to a cardiac catheterisation facility. [9] Patients with 12 lead ECG telemetry had a time to reperfusion of 41 minutes, while the control group reported mean times of one hour and 11 minutes. [9] This study is limited by its observational design.

The rural population may be the ones who benefit most from 12 lead ECG telemetry. In an English study published in 2014, ECG telemetry allowed a mean reperfusion time of less than two hours in 89% of patients presenting with STEMI up to 95km from a facility with cardiac catheterisation capability. [10] This is a particularly relevant finding to the South African milieu, as many of our healthcare inequalities are due to geography. [4]

The South African Coronary Care System

An unpublished pilot study conducted in the Northern parts of South Africa showed a median reperfusion time of 14 hours in STEMI. These times were as high as 48 hours. [11] With successes displayed in numerous other settings, the question remains: Why is South Africa not utilising these initiatives to improve reperfusion times? Locally, coronary care is challenged by lack of cardiac catheterisation centres that are regionalised to the urban and peri-urban setting, lack of advanced life support providers to obtain 12 lead ECGs within the prehospital setting and poor telecommunications infrastructure in the rural setting. For this reason, research and development efforts need to be geared towards establishing all aspects of a coronary care network, in order to improve the care that patients receive locally.

Conclusion

The selection of studies presented highlights the importance of prehospital diagnosis of STEMI and the need for early activation of the cardiac catheterisation teams. This may greatly decrease the reperfusion times of patients presenting with STEMI, and eventually lead to an improved morbidity and mortality profile of the ever-growing population presenting with ischaemic heart disease. Yet, South Africa is burdened by a nascent coronary care network that is riddled with inequalities in resource distribution. In order to avoid an inevitable disaster come 2020, South Africa and Sub-Saharan Africa need to urgently relook their commitment to coronary care.

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LOW-COST HIGH-RELEVANCE SIMULATION IN CLINICAL SKILL ACQUISITION: IS IT ABOUT TECHNOLOGY?

Roderick Campbell

The objective of this article is to reframe the idea of simulation in the emergency care context and suggest a change in focus from simulation as a technology to simulation as a technique to enhance clinical experience.[1] In order to achieve this, a brief definition of clinical simulation is necessary together with the application of this definition to the traditional use of simulation in emergency care education in South Africa. A brief discussion of what translates the technique of simulation to a good simulation experience will be followed by the application of fidelity aspects to simulation design.

Essential principles when considering simulation design and simulator technology are presented using intravenous (IV) cannulation as an example. A brief discussion of the cost of technology (simulator) and cost factors within the process of skill acquisition will be presented. The assumption is made that the requisite knowledge relevant to psychomotor skills is in place in order for a participant to learn or perform the skill. This discussion does not include the full range of simulator types or the scope of what simulation can achieve.

Assumptions about healthcare simulation as an educational methodology in emergency medical care education

Healthcare simulation is both a method of instruction and an assessment tool and supports a patient-focused, learner-centred educational approach.[2] The outcomes-based education paradigm, constructivist theory of education and principles of constructive alignment demands that the assessment process, process and instruments are aligned to real-world conditions (authentic situation) and expectations, and that learning is aligned to this in turn. [3-5]

What is simulation in emergency care?

In order for an event to be labelled as a healthcare simulation, three essential elements must be present. Firstly, there needs to be a model or simulator that represents essential physical and /or physiological features of a patient and clinical situation or environments.[6-7] The extent to which a simulator replicates the physical, visual and tactile features of a real patient reflects the realism or fidelity of the simulator and contributes to the physical fidelity dimension of the simulation experience. Simulators are classified as low, medium or high-fidelity.[8] The contextual use of the simulator provides a second feature of the simulator. The context is also referred to as the *"clinical setting"* where the spatial and temporal features relevant to the simulated task can enhance realism of the experience.[9-10]

In the emergency medical care education context part-task trainers are typically used to teach psychomotor skills. Part-task trainers represent a part of human anatomy and may have some associated, yet limited physiological features.[11] Examples of part-task trainers include the blood pressure (BP) trainer, the intravenous (IV) arm and various airway trainers. Simulators that reflect physiological features include BP trainers, simulators eliciting lung and heart sounds for auscultation and those facilitating

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electrocardiography (ECG). The range of full-body manikins represent holistic features of the human patient and have varying representation of anatomical and physiological features. Full-body manikins may be used for psychomotor skills such as manual defibrillation and transcutaneous pacing, as well as for cardiopulmonary resuscitation (CPR) and integrated patient care events.

The second element of simulation is that it allows participant interaction. This implies that simulation is a process occurring over time.6 Examples of interaction with part-skill trainers or full-body mannequins include where a BP reading can be obtained, an IV cannula can be inserted into the "*vein*", the airway can be opened and an adjunct placed, ventricular fibrillation (VF) can be identified and defibrillated, and rate and depth of chest compressions can be performed.

The third element of simulation is that it requires participant engagement. This element reflects the willingness of the participant to engage in the simulation event, whether learning or demonstrating a skill, or engaging in a full simulated patient encounter. The interactive and engagement elements of simulation contribute to an "immersion" experience which is defined as *"…any situation which is highly interactive and engages the learner in such a way that disbelief is suspended and the learner becomes an active participant in the experience"*.[12]

The interactive and engagement elements are encapsulated by Gaba[1] who defines simulation as *"…a technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion."*

Definition of terms from the International Nursing Association for Clinical Simulation and Learning (INASCL)[13]:

Simulation: *"A pedagogy using one or more typologies to promote, improve and/or validate a participant's progression from novice to expert."*

Typology: *"…refers to the classification of different educational methods and/or equipment used to provide a simulated experience. For example, simulation methodologies may include written simulation cases, 3-dimensional models, computer software, standardized patients, partial task trainers, or high-fidelity patient simulators."*

Fidelity: *"Believability, or the degree to which a simulated experience approaches reality; as fidelity increases, realism increases. The level of fidelity is determined by the environment, the tools and resources used, and many factors associated with the participants. Fidelity can involve a variety of dimensions, including (a) physical factors such as environment, equipment, and related tools; (b) psychological factors such as emotions, beliefs, and self-awareness of participants; (c) social factors such as participant and instructor motivation and goals; (d) culture of the group; and (e) degree of openness and trust, as well as participants' modes of thinking."*

Psychomotor skills: *"The ability to carry out physical movements efficiently and effectively, with speed and accuracy. Psychomotor skill is more than the ability to perform; it includes the ability to perform proficiently, smoothly, and consistently under varying conditions and within appropriate time limits."*

Skill Acquisition (Skill Attainment): *"After instruction, the ability to integrate the knowledge, skills (technical and nontechnical), and attitudes necessary to provide safe patient care. The individual progresses through five stages of proficiency: novice, advanced beginner, competent, proficient, and expert…"*

Skill Development: *"The progress along a continuum of growth in knowledge, skills, and attitudes as a result of educational or other experiences."*

Definition of simulation applied to traditional EMC training in South Africa

Three components traditionally used for assessment of practical competence in emergency care training programs include clinical procedures (psychomotor skills), CPR and patient simulations.[14] The term *"simulation"* has mostly been used when referring to the patient simulation whereas the performance of clinical procedures and CPR are also conducted and assessed using simulators, have interactive features and require engagement by the participant thus containing the three elements of *"simulation"*. This means simulation is being used by emergency medical care educators in South Africa to teach and assess psychomotor skills, CPR skills and holistic patient care. The *"typology"* of simulation for each is different since each uses a particular type of simulator (part-task trainer, CPR mannequin and /or full-body mannequin) and has different objectives.[8,13]

What makes a good simulation experience?

Teaching the broad spectrum of skills required for clinical practice in emergency care first engages the learner as a novice (irrespective of the year of study when a skill is being learnt for the first time). The technique rather than the technology determines the realism of a simulation experience. A high-fidelity experience can be achieved using low-technology simulators whereas using high technology simulators may not necessarily lead to a high-fidelity simulation experience.[15]

As can be identified in the INASCL[12] definition of *"fidelity"*, there are many important factors

to be considered when designing a simulation event. In order to enhance interaction and draw the student to engage meaningfully with the tasks associated with clinical practice, aspects need to be identified that link to the real-world context and practice. This means that sufficient characteristics of the true context and conditions of clinical practice need to be present that relate to the simulation task.[11] When this occurs then participants are more likely to believe in the experience and can link it to real clinical experiences (either previous or future experiences).

Since simulation seeks to replicate all or part of real clinical encounters, rules that translate the real-world clinical settings into simulation need to be identified and applied consistently to avoid confusion and perceptions of deception by participants.[16] Where aspects of the simulation differ from the real world, these need to be clear to facilitators and participants and reasonable options provided on how to meaningfully interpret these differences. An example would be where an image (photo) is used to show a visual feature which is not physically present on the simulator yet is explicitly connected to the clinical scenario and relevant to a task. The rule is that the participant should link the image to the simulator and engage the "patient" and / or task as if this feature was physically present. Verbal cues can be used in a similar manner.

Another factor in engaging participants is where certain tasks and actions can be performed as they would in the real clinical setting and which force participants in that direction.[16] This would include explicit allocation of responsibility by putting the participant into the role of the qualified practitioner and letting the course of actions have realistic clinical outcomes (good or bad). Where real equipment can be used that is available in practice then realism is increased. Examples include when a biphasic defibrillator is really charged to 150J and a full-body mannequin displaying a VF is defibrillated.

Rethinking low-technology high realism simulation for developing psychomotor competence

Psychomotor (clinical) skills may be simple procedures such as testing blood sugar levels using a glucometer or more complex procedures such as transcutaneous pacing. Skills can be broken down into a subset of tasks related to patient interaction and technical aspects of the skill including use of technology and medical disposables. Each of these needs to reflect contextual and task relevance to the real situation.[17] Dreyfus[18] suggests that a task may be comprised of non-situated aspects for which no prior or background knowledge is required, and situational aspects which require knowledge of the background, application and conditions for task performance.

Taking IV cannulation for fluid administration as an example, the subset of tasks include patient interaction for consent, selecting and preparing an appropriate cannulation site, cannulating the vein, confirming placement, attaching and securing the cannula and administration set, setting the flow rate and documenting the procedure in the clinical record. Selection and preparation of the IV fluid administration system may be considered a separate skill but may be integrated into the procedure for establishing IV access relevant to the learning or assessment objectives.

When a participant is learning IV cannulation, it may be necessary to isolate the tasks and use simulation to develop competence for each. In this sense a model is used specific to the subset of tasks in question. For some tasks, real equipment should be used (this would then constitute the real versus simulated component of the task). A real drip and administration set which is properly prepared (pre-configured or part of an integrated task) should be used to connect to the hub of the cannula. Non-situated aspects of the task may include physically identifying different types of fluids and administration sets, checking sterility and expiry dates, preparing an IV administration system, and identifying IV cannula bore sizes and features (bevel, cannula, colour-coding and chamber).

A person can play the role of the patient from whom consent needs to be requested. With minimal training, people can reflect a variety of responses when engaged for consent. This could include the compliant patient, the obnoxious patient and the fearful patient as examples. These persons now take on the role as the "*simulator*" and are known as "simulated" or "*standardised patients*." [19] Fellow-participants can also assume this role and if taken seriously may learn empathy by taking on the role of the patient and experiencing the interaction from the patient point of view. As stated by Nestel et al,[18] standardised patients "*…have potential to be the highest fidelity 'simulator'*…" Feedback from the standardised patient to the participant is valuable for learning and developing communication skills and self-awareness necessary for clinical practice.[18]

Real people are also the best "simulator" for identifying veins for cannulation. The low-technology part-task trainer for physical cannulation of the vein is limited in that the "veins" do not change nor do they reflect variations in patient condition affecting cannulation. Where participants have an opportunity to locate veins for cannulation on a wide variety of people an experience base for differences between gender, ethnic grouping (particularly skin colour), age and body fat is developed. This also offers the real feel (tactile) and affords additional opportunity for interaction with people. The standardised patient can therefore fulfil the simulator role for obtaining consent and identifying and locating a vein for cannulation providing the best realism for these tasks. The limitation may be that healthy people typically make up this pool of "simulators" so difficulty in locating a vein due to patient conditions such as hypovolaemic shock or vascular disease may not be experienced.

Various low and high-technology part-task trainers are available for the physical cannulation of the vein. Plastic IV arms, pads and hands are low-technology simulators for this purpose. Various part-task training models are also available for external jugular vein cannulation and femoral vein cannulation. Simulated blood-filled "veins" can provide flashback of "blood" on cannulation, confirm placement by getting a back-flow of "blood" into the administration set and allow fluid administration which are all essential elements of the real context. Reality can be enhanced by combining the IV arm with a standardised patient where the arm

is "attached" to the patient and real patient interaction and role-play responses can be achieved.

High-technology part-task trainers for IV cannulation are available and use a combination of computer-based software and haptic (tactile) features where various cases simulating cannulation difficulty and age groups are provided and various forms of immediate feedback available.[20-21] Realism is enhanced through finalising the process linked to IV cannulation by attaching and securing the administration set to the hub of the cannula using real medical disposables, setting the flow rate and documenting the procedure in the clinical record (where this is included in the objectives).

The contextual element of IV cannulation is a significant consideration in emergency medical care education. In practice, EMS personnel work from medical bags containing pouches. The IV bag would contain various IV fluids, administration sets, a range of IV cannula bore sizes, alcohol swabs and materials to secure the IV cannula and administration set. To have a limited or specific selection of items laid out on a table for use may not be realistic if the objective includes selecting the appropriate equipment. Patients are also found in a wide variety of contexts and environments. Patients may be seated, lying supine or in the prone position. Patients may also be in confined spaces like in a toilet cubicle or trapped inside a vehicle. Various environmental factors such as poor lighting and low temperatures may present. These factors change the conditions for IV cannulation and may affect performance of this procedure. As stated by INASCL[21] *"…Psychomotor skill is more than the ability to perform; it includes the ability to perform proficiently, smoothly, and consistently under varying conditions and within appropriate time limits."*

Cost-considerations: what lies beyond technology?

An essential aspect of learning through simulation is the availability of immediate and accurate feedback on performance against a set standard and necessary for each attempt at performing a skill for maximum learning benefit. This is highly relevant to patient safety and best practice and promotes learner confidence, proficiency and conscious competence.[20-22] The benefit of healthcare simulation is determined by the extent to which simulated experiences translate to meaningful clinical practice.[21]

A study by Bower *et al*[20] examined the effectiveness of simulation using two virtual reality (VR) hybrid simulators compared to a traditional low-fidelity IV arm simulator for novice students learning to site IV cannulas for the first time. Their study demonstrated that both VR simulated IV training and traditional IV arm training were effective in teaching IV cannulation. Their study did, however, indicate a significant improvement in performance using the VR hybrid simulator over the traditional IV arm simulator.

A study by Loukas *et al,* [21] evaluated the learning curves for IV cannulation of novice and intermediate learners using a VR hybrid simulator. Assessment criteria included time to completion and error rate. The VR IV cannulation simulator allowed for the representation of different cases and age groups. The results demonstrated a difference in the number of attempts by novice versus intermediate level students in reaching a plateau of efficiency (time) and safe achievement of cannulation (acceptable error).

The advantages of the high-technology VR IV cannulation trainer include an instructor-free repeatable practice opportunity, robust computer-generated performance monitoring and immediate feedback, minimal preparation time of the simulator, minimal involvement of instructors, minimal use of disposables and variable options for case difficulty and age group.[20-21] Disadvantages include anomalies in the tactile feature of skin stretch and angle of insertion compared to real life reported by research participants.[21]

The advantages of the low-technology IV arm trainer are the physical cannulation process using real IV cannulas, realistic feedback of cannulation by "blood" entering the chamber as well as back-flow of "blood" when confirming placement. The disadvantages include maintaining mechanical aspects of the simulator such as "blood"-filled "veins", and costs of "skin" and "vein" replacement to maintain simulator integrity. Where participants engage in this aspect of maintaining "blood" flow they may lose elements of realism by involving themselves in simulator function which disrupts the procedure. The tactile realism is limited and "vein" position and cannulation difficulty is static. Practicing under true conditions requires a high rate of medical disposable usage (IV cannulas in particular). The manufacturer may also recommend using only a specific needle bore size to extend the number of cannulation attempts before "skin" and "vein" replacement is required.

In the initial phase of skill development in the novice learner, a high instructor-student ratio is required where a student should not practice without careful observation, guidance and feedback by an instructor to ensure trueness to real-world conditions. Where this is neglected students may take short-cuts or there may be a subtle invasion of bad-practice creeping in with distraction, poor simulation design and inadequate point-of performance supervision with risk of translation to practice and risks to patients. Where bad habits become "muscle memory" [22] they become difficult to replace. Unfortunately, these bad habits may only be picked up with formal assessment where students may then be given the benefit and are signed off on the procedure. It is not *"practice makes perfect"*, but *"perfect practice makes perfect".* [22]

These factors of balancing low-cost, low-technology simulators with true costs associated with maintaining a high standard of clinical education benchmarked against patient safety and best practice are essential when designing a simulation curriculum and subsequently selecting which simulator technology to use.

Conclusion

Conflict of interest:

The author declares no conflict of interest and deliberately refrains from using specific simulation product names to avoid such conflict.

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OPEN ACCESS

EDUCATION

OPEN EDUCATIONAL RESOURCES IN EMERGENCY CARE

Gregory Doyle | Veronica Mitchell | Michael McCaul

Introduction

Emerging medicine can benefit from the new learning landscape in which traditional teaching and research practices are being transformed by the internet. 'Normal' copyright laws not only restrict creativity and sharing, they are also complex to navigate and are being challenged in our current digitally connected environment (Loren, 2006). Now Creative Commons (CC) licensing with its various options of permissions, brings an expanded platform for higher education offering six degrees of openness. These relate to acknowledgement, commercial use, degree of sharing and whether derivatives are allowed or not.

Open Educational Resources (OER) are enabling the free sharing of material through these licensing alternatives. The claim is that "everyone should have the freedom to use, customize, improve and redistribute educational resources without constraint" *(Cape Town Open Education Declaration 2007*). OER are defined as "any type of educational materials that are in the public domain or introduced with an open license" (*UNESCO*). These resources can vary in granularity from entire courses and modules to single page texts or images. The creator of the resource chooses how they would like to be acknowledged and the degree of openness by the kind of CC license. There are six different levels of permissions in terms of re-use, revision, redistribution, remix and retention as reflected by the license. David Wiley of Lumen Learning has been one of the leaders in the OER movement pushing for free resources as a mission for the public good.

Apart from text and still images, videos, animations and audio recordings can also be used in this way. Dr Tobias Schonwetter, Law faculty at UCT recently published guidelines for CC licensors. He engages with issues on how the terrain of intellectual property is changing in South Africa and globally, However there is some confusion with the concept of open access (OA) resources which are those that are openly available on the internet. OA is different to OER which is governed by licenses to ensure acknowledgement of the creator with some rights reserved.

While changes in practices have been slow to adopt OER, there is a growing uptake in terms of policies in education. For instance the Department of Higher Education and Training issued Policy 535 in July 2014: (Government Gazette No. 37811) affirming the need for an enabling environment in which OER are used and produced to improve the quality of training (Policy for the provision of distance education in South African universities in the context of an integrated postschool system). UCT and UNISA have also incorporated institutional policies to encourage the use of OER for consumers and producers.

The full value of OER is still in the embryonic stage. A locally driven international *collaborative project ROER4D* is evaluating the impact of OER in the global south. Open education repositories are becoming increasingly evident. *Open UCT* was established in July 2014 with different Faculties showcasing and sharing their resources freely. Within this repository are resources for Emergency Medicine.

OER in pre-hospital care

Flagship projects in OER such as the Khan Academy set the gold standard, setting the bar in global impact and sustainable knowledge translation. Pre-hospital OER is showing great promise as local OER champions, higher educational institutions and societies take the stage producing quality materials with creative commons licences giving permissions for sharing and reuse. Not only are these materials a valuable resource for emergency care providers but provide the potential to expand into the essential sphere of first aid training, an apparent tightly controlled and 'closed' training system. Despite the challenges with going open we showcase some of the local South Africa champions in pre-hospital care in South Africa.

Current OER resources in pre-hospital care

UCT - Division of emergency medicine

UCT emergency medicine consultants and registrars demonstrate various emergency medicine skills through ranging

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from basic suturing techniques to advanced airway procedures. These short video summaries of 3-6 minutes are useful resources for students studying emergency care and emergency medicine. These resources are registered under the creative commons attribution-noncommercial sharealike licence. Click here to navigate to the site hosted by creative commons UCT.

Champions of OER in pre-hospital care

The ECSSA research and development special interest group (R&D SIG) are currently hosting a 5 part webinar series on the fundamentals of descriptive research aimed at any emergency care providers interested in research. The webinar series, initiated at the beginning of the year has covered topics such as error, bias and confounding in descriptive research, data collection tools aswell as sample size and power calculations for descriptive studies. Future projects for the SIG include a webinar series on the 5 steps of evidenced based health care.

Need/discussion on capacity development of OER in pre-hospital care

The skills and knowledge developed in South Africa in emergency medicine can be shared globally through OER, an example of knowledge generated from the south being picked up by others in northern developed countries - a turnaround from the usual and a potential that has been enabled through the open movement. Considering the growing need and use of open access education resources worldwide South Africa has the potential to lead the charge advocating OER globally. Collaboration between OER champions and capacity building of interested parties would be essential to set a strong foundation in South Africa to move OER from stand alone projects in emergency medicine to a flagship collaboration impacting clinicians locally and worldwide. Despite OERs great intentions it is not without current challenges and controversy.

Challenges

Due to the emerging nature of OER, there are few impact studies available. Open processes are needed apart from open resources (Knox 2014). Buy-in to the concept has varied shaped by many factors for producers such as their willingness to share, a fear of the openness of the web and frequently lack of knowledge about OER and CC licensing. Using OER from others as consumers is a different way of developing teaching practice. Tracking educational impact of OER is another challenge but one that has been made easier with the introduction of internet metrics and google analytics.

There are concerns about quality control when academic material is published without peer review. However a critical perspective for all web-based resources ought to be a key factor in educational training.

The way forward – recommendations

Hodgkinson-Williams (2014) refers to the 5 influences that determine the trajectory of openness namely technical, legal, cultural, pedagogical and financial. With these influencers we recommend 5 goals to pave the way forward for emergency care OER in Africa.

- Promote the awareness and advocacy of local OER in emergency care
- Build capacity of young African champions in OER
- Establish a localised hub of support and dissemination of emergency care OER
- Obtain sustainable funding for emergency care OER in Africa
- Promote international collaboration with OER flagship projects

Conclusion

Internet access and the willingness to share resources through creative commons licensing in the form of different levels of permissions, is enabling and empowering educators and students to access and legally use resources. Previous restrictive copyright rules and costs limited the access and availability of these resources. The production and consumption of OER in emergency care shows great promise and potential to change the landscape of emergency care education into the future.

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OPINION

SIREN SICKNESS

Victor Voorendyk

Introduction

Of all the technology involved in the provision of Emergency Medical Services (EMS) to the public, one particularly significant technological resource has evolved tremendously right under our noses over the years. This resource is possibly one of the most under-appreciated, yet fundamentally essential *tools of the trade* without which even the best emergency care provider can offer little to no service. The ambulance has helped EMS around the globe for decades to provide essential emergency medical care to patients in need, but carries with it the dangerous curse of siren sickness.

Context

In Greek mythology, the Sirens were mystical creatures, inhabiting an island, who lured sailors to their doom by way of their enchanting song[1]. Similar to the unfortunate end of so many sailors in mythological writings over the millennia, so too the song of the ambulance siren – often associated with salvation in times of crisis – has tragically also lead to the demise of many good men and women within our profession. The majority of EMS providers will easily be able to attest to stories being shared among peers of responding at high speed, weaving in between cars and challenging oncoming traffic. This sincerely leaves us to question the extent of forethought underlying some of the risky driving manoeuvres and decisions executed by those responding in emergency vehicles.

Indeed we operate within a profession where time is of the essence, but when egoism overshadows reasonableness on the roads, we are left with a substantial public safety concern. This article is intended to encourage rational thinking amongst emergency response drivers on South African roads by creating a deeper understanding of both the risks and implications of emergency response driving gone wrong. The duty of EMS to react promptly to emergency calls for assistance is accompanied by an implicit corresponding *responsibility* to respond in a professional manner with an attitude of *safety first*. This includes having regard to one's personal safety, the safety of one's crew and especially the safety of other road users. Anything short of this conduct may be regarded as unprofessional and should not be tolerated within the profession[2].

The curse of siren sickness

In his book Paramedic: *Lights and Sirens*, author Steven Webb – also a member of the emergency services profession in South Africa – alludes to the idea of *siren sickness*. This EMS jargon is commonly understood to describe a situation where an emergency response driver develops a sense of immunity to the dangers of high speed driving due to tunnel vision making him or her *impervious to their surroundings* when the lights and sirens are activated[3]. This phenomenon is not unique to the South African EMS environment by any means and it is reported that in the Unites States, there are 10 serious injuries involving EMS every day and 10, 000 ambulances crashes a year[4]. It appears that EMS globally is overrun by a culture of *rescue first, my safety later* – a regrettable attitude that contradicts the most basic EMS teachings of safety being the first consideration and indeed the provider's top priority. This attitude amongst EMS personnel across all levels of qualification seems counter-intuitive and is associated with behaviours and trends that worsen safety in many EMS agencies[5].

Fuel to the fire in SA EMS

If *siren sickness* stems from a culture that – to a large extent – is inherently part of the EMS profession internationally, it should be considered whether any other factors within the our local industry play a specific further role in perpetuating the issue of poor road safety practices that is so often exhibited by South African emergency response drivers. Arguably some of the major issues include the huge competition element between the vast numbers of private EMS companies in South Africa; pressure placed on EMS crews from management in both the public and private sectors to pursue response times that do not have any scientific or evidential basis and

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finally inadequate EMS access and call prioritisation infrastructure.

It is a practical reality that many State EMS agencies within South Africa are failing to meet the needs of the public[6]. Shortages of vehicles and similar essential resources within the public sector increases the strain placed on existing personnel and infrastructure[7], which in turn jeopardises the service expectations (and often too the health and safety) of the public[8]. From this service deficit, private EMS companies often emerge in order to supplement the service needs of the public[9]; however this is generally on a commercial basis with the objective of making a profit. The commercial nature of these entities propagates competition among rival companies who then have the added pressure of reaching emergency scenes, such as motor vehicle accidents, first in order to secure a revenue-generating callout. Safety in responding to a call is therefore often dispensed with in favour of ensuring the financial viability of a commercial enterprise.

The issue of EMS response time is a particularly tricky matter to digest. On the one hand, a rapid response with red lights and sirens ("RLS") to emergency calls may be warranted as a means of ensuring quality in the process of rendering emergency medical care[10]; however it is acceptable to say that not all calls received by EMS are true life threatening emergencies. Internationally, it appears as if there is increasing momentum behind discouraging the standard use of RLS for all turnouts, thereby limiting RLS responses to clearly defined high priority incidents, depending on the individual circumstances of each case[11]. In one British study, it was held that the standard 8-minute response time window utilised by many EMS agencies around the world is not evidence based and is putting patients and ambulance crews at risk[12]. Although a level of call prioritisation whereby incident severity can be accurately graded is certainly ideal, it is unlikely that the South African industry might ever reach such a level of system maturity. As it is, internationally even, there is little evidence about the safety and effectiveness of alternative emergency response models and whilst such alternatives are needed without question, there is a great deal of complex work required for their development[13].

Dealing with the *status quo*

Although there are globally relatable trends within our own domestic profession as far as questionable emergency response driving is concerned, it is imperative to pay sufficient attention to concerns on the home front. If *siren sickness* results from an attitude or behavioural culture within some of our EMS providers it is only correct to say that we ourselves should be advocating for the alternative mind set of *safety first*. How often is grossly exaggerated driving by an EMS provider really executed *exclusively* with the patient's interests as motivation? The real answer may be a disheartening truth when it is discovered that, more often than not, rapid response driving is fuelled instead by adrenaline and a basic human craving for excitement.

This leads the discussion to the issue of *reasonableness*; for somewhere one the scale there must exist a balance between the demand for rapid emergency response and careful regard for the safety of others and also oneself as the emergency responder.

The stern consequences of siren sickness

Legal punitive measures often serve to regulate the conduct of persons within society. Unfortunately the scope and especially the full implications of these measures are seldom appreciated by the public at large. EMS providers, like any other person within the Republic of South Africa, are subject to the rule of law and in this regard a careful understanding of the exact consequences of poor driving judgement is most helpful in mitigating against the danger of *siren sickness*.

There are technically three bases in terms of which an EMS provider may incur liability when response driving goes wrong. The extent to which the provider may be affected by such liability depends of course on what particular effect has resulted from his or her driving – has there been damage to property, was harm suffered by a person or did a death result from the conduct of the responding EMS provider? These technical levels across which liability can be spread in the most basic sense are thus *criminal, civil and "professional"*. The latter instance refers to the case where the responsible EMS provider may be accused of unprofessional conduct before the Health Professions Council of South Africa (HPCSA). Unprofessional conduct is defined in the Health Professions Act 56 of 1974 as *improper or disgraceful or dishonourable or unworthy conduct or conduct which, when regard is had to the profession of a person who is registered in terms of this Act, is improper or disgraceful or dishonourable or unworthy.* Inconsiderate or reckless and negligent driving could easily qualify for a charge of unprofessional conduct before the HPCSA, depending on the nature of evidence upon which the complaint is based.

Civil liability results when the conduct of the EMS provider causes damage or harm to another person (which may be a natural or juristic person) or property. An affected party would be able to sue the EMS provider and possibly even his or her employer vicariously – depending on the particular circumstances of the matter – for damages sustained as a result of the EMS provider's damage-causing actions on the road. Where the EMS provider has behaved negligently, thereby resulting in damage to the employer's property, for example by crashing the emergency vehicle under that driver's control, it is not impossible nor unreasonable for that employer to hold the driver responsible for the damages suffered in the incident[15].

Most importantly – for purposes of this article – is the issue of criminal liability. Chapter IX of National Road Traffic Act 93 of 1996 (as amended) deals with a range of road traffic offences, but most notably specifically prohibits and details the offences of reckless and negligent driving as well as inconsiderate driving. Whilst some exemptions to driving restrictions apply to the driver of an emergency vehicle, Sections 63 and 64 of the Act form the basis of any discussion pertaining to the implications of poor emergency response driving. One point of importance is that a court is obliged to scrutinise the manner in which an offending vehicle was

driven in the given circumstances at the time of incident. Section 58 of the Act prescribes that failing to obey a road traffic sign is prohibited, but furthermore that certain classes of emergency vehicles (including ambulances) in particular circumstances may disregard the directions of a road traffic sign on the strict conditions that:

- a. the vehicle shall be driven *with due regard to the safety of other traffic*; and
- b. the appropriate warning devices prescribed in terms of the Act shall be in operation when the driver so disregards the directions of a road traffic sign.

Under Section 60 of the Act, the driver of an emergency vehicle is permitted to drive in excess of the general speed limit, subject to the same conditions referred to above. It is interesting to note that the Act allows the driver of an emergency vehicle to disobey road traffic signs and drive in excess of the prescribed speed limit, but that it does not specifically authorise reckless and negligent driving nor inconsiderate driving. A discussion on the possible defences or grounds of justification in relation to charges of inconsiderate- or reckless and negligent driving is beyond the scope of this article.

Perhaps the most frightening reality for any driver is the fact that every motor vehicle accident carries with it the potential of ending the life of another human being or at least causing some form of serious harm. Emergency response driving is riddled with unpredictability, which substantially increases the risk of damage and harm to both people and property in the event of mishap. People have been killed and others seriously injured in the past in accidents involving emergency vehicles and here perhaps is where the greatest wakeup call for EMS drivers should lie: If another person is killed as a result of the reckless and negligent driving of an emergency vehicle, the driver may face a charge of culpable homicide which carries a very real chance of conviction to a term of imprisonment.

South African Courts and the National Prosecuting Authority in recent years have gone even further, as is evidenced in matters such as the *Jub Jub case* where charges of murder and attempted murder were brought against the two accused in March 2010 for drag racing and colliding with a group of school children, killing four of them in the process[16]. The chances, depending on the merits of the case, are disconcertingly high that the EMS provider whose conduct leads to the death of another person in a motor vehicle accident may face similar intention-based charges. In this regard, there are two requirements relating to the driver's conduct in order to substantiate a charge of murder or attempted murder on the basis of what is known in law as *dolus eventualis:* First, there should be subjective foresight on the part of the accused as regards the possibility of committing an unlawful act or creating an unlawful result. Secondly, it is required for the accused to reconcile himself or herself to this possibility[17].

Conclusion

It is accepted that there is inherent risk in emergency vehicle driving[18]. Whether South Africa will ever see the day where distinction is made by EMS agencies across the country between true emergency callouts and non-emergent cases for purposes of emergency response leaves much to be desired. While our system currently supports standard RLS activation of EMS resources to calls for assistance, the best we can do as a profession is to advance a shift in culture to a *safety first* frame of mind. Knowledge of adverse consequences for poorly informed actions on our roads is perhaps the best way to empower EMS providers and their agencies respectively in combatting *siren sickness.* It should always be borne in mind that EMS consists of professionals involved in the rendering of emergency medical care. Safely responding to distress calls is an enormous part of the work carried out by EMS. Similar to the way in which we strive to prevent harm to our patients, so too it is imperative that the profession works actively to mitigate against risk on the road and to ensure that no harm befalls us or the communities that we serve by virtue of our own actions.

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OPINION

THE PARADOX OF TECHNOLOGY

Chris Stein

Almost every day, in our highly connected and device-dependent lives, we hear about an "old" process or activity that has been "upgraded" to a new, electronic form. In the current climate of tablet-mania, this frequently involves taking a process or activity and "gadgetising" it. The phrase "there's an app for that" highlights this phenomenon, that we seem to be obsessed with literally having an app (or a website, which actually is also an app) for everything.

In this flurry of one-"app"manship I'm not certain that we really critically evaluate whether "going digital" with everything truly adds value to our lives and to the processes involved, and whether it simplifies (as we claim it does) or complicates our lives, whether it helps us manage or frustrates us, whether it makes our business processes more efficient or more wasteful.

In his writings on the design of everyday things, cognitive scientist Donald Noman first described an apparently paradoxical phenomenon associated with new and evolving technology. Norman observed that, at first, new technology is introduced and implemented in designs that help us and that seem to be big on usefulness and small on complexity. You may well sneer as you remember now the first of a range of electronic devices that you ever used (computers, cellular phones etc.) but you cannot deny that you were impressed by how much they changed your life and how apparently simple they were to use with apparently little experience.

This comfortable state of affairs, says Norman, does not last forever. The ease of use and utility experienced with new technology makes it popular, and spurs its designers and manufacturers to make it "better" by adding more features. This tends to enhance complexity more than usefulness, especially if the new features are not well designed. The end result is a technology that was uncomplicated and useful, becoming less useful and more difficult to use and complicating life instead of simplifying it. The U-shaped curve of complexity over time, starting high then decreasing and finally ending high, is what Norman refers to as the paradox of technology. That the same technology can simplify and complicate life, depending on how it is designed and developed over time. Norman cites such simple examples as the wrist watch and radio to illustrate his point that our desire to simplify often simply leads to frustration.

Does this paradox sound familiar to you? I'm sure you can think of some emergency care-related examples that would apply. Perhaps a simulation manikin that has so many complicated features that you don't even use half of them? Perhaps an electronic patient care record application that seemed like such a good idea, but that now seems so complex to use, manage and maintain that you wish you could go back to paper records? Or a monitor that does so much that you can't figure out how to do simple things with it most of the time?Technology undeniably has the potential to improve life, and even radically alter it, for the better. However it is not all good, as the paradox explained above suggests. You may argue that the potential disadvantages of advancing technology and its application to everything we do are offset by the advantages, by the good that it does. So what if we struggle with a device every now and again, or are frustrated by how complicated an apparently simple process involving new technology has become? The dark side of technology is that it always costs us, and frequently costs us a lot. In time and effort, but more importantly in money. The newspapers (which we read these days on a tablet of course) regularly tell us of obscene wastefulness that occurs in the pursuit of technology implementation – either because glitzy projects are never completed or because the technology involved fails because it is too complex or unreliable to support and enhance the processes it was supposed to.

I often wonder how much better

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things could be if that wasted money were spent on simpler, more reliable and less complex solutions that didn't have to involve an electronic device. The challenge that we face is to try and be more selective about how we use technology, and what we use it for rather than throw a gadget at every problem. Successfully applied technology can be a life and game changer, but technology poorly applied not only frustrates use, it wastes our valuable resources and often sets us further back than if we had not even contemplated using it at all.

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TOWARDS PROGRESSION: THE EMERGENCY CARE RESEARCH AND DEVELOPMENT SPECIAL INTEREST GROUP WEBINAR SERIES

Michael McCaul

The Emergency Care (EC) Research and Development Special Interest Group (R&D SIG) was formed in March 2014 and has grown significantly, both in activities and ambition. Their aim is to improve the quality and quantity of research within the domain of local Emergency Care. This article will provide a brief summary of their activities to date.

The R&D SIG was formed in March 2014 by Michael McCaul and Willem Stassen in order to advance the local emergency care research output and to provide support to young researchers who are looking to advance their careers by putting them into contact with role-players and experts in the field. Part of the special interest group's goals is to build capacity in young researcher in South Africa. In the beginning of 2015, the R&D SIG launched a 5 part webinar series aimed at young and upcoming researchers.

Back to fundamentals

Much like a gateway drug, descriptive studies provides the springboard for researchers to move to more exciting and sometimes dangerous study designs. Descriptive studies are really the best at what they do, often the first toe in the water, describing what has not been described before, laying the foundation for future research and hypotheses.

The importance of descriptive research cannot be over-emphasised especially within the current South African climate where there is a paucity in routine emergency care data. To this end capacity building of young researchers is essential and a burden that lies at the heart of the R&D special interest group.

The 5 parts webinar series 'fundamentals of descriptive research', is a live event for anyone with an interest in research. Online participants have thus far enjoyed four of the five presentations. The webinars have been made possible through the support of the Centre for Evidence Based Health Care (CEBHC) at Stellenbosch University and OPEN UCT. The four webinars to date have covered various topics including phrasing questions, bias and error, data collections tools and power and sample size for descriptive research.

Webinars: the past, present and the future

The first webinar in the series 'Introduction to descriptive research' described the introductory principles of research question generation and the essential tenet of aligning the research question with the appropriate study design. So often researchers start with 'what kind of study design can I do?' instead of asking 'what is the best study design to answer my research question?' Characteristics of descriptive research was discussed within the context of the hierarchy of evidence followed by a brief overview of different study designs in clinical epidemiology.

The second webinar series addressed 'bias, error and confounding' in descriptive research. Bias or deviation from the truth can be classified into two primary causes, information and selection bias. The principle of random error

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was introduced followed by an example showcasing the effect of confounding.

'Research tools for data collection', the third webinar series, introduced various concepts for both descriptive and other research designs. Validity and reliability measures of data collection tools was emphasised before various methods of data capturing was discussed. The discussion ranged from traditional methods of using Excel or Access to more advanced systems such as the different electronic data capturing software available. Lastly we showcased different free and online electronic data capturing software including RedCap and Kobotoolbox.

The last two concluding webinars will include presentations on 'sample size and power calculations' and 'data analysis and reporting of descriptive studies'.

Future projects

The research and development special interest group is conducting a scoping and mapping review of emergency care research in Africa. A secondary aim of this research output would be to create a database of published and unpublished research. Eventually, anyone with an interest in conducting locally relevant research can access this database through the ECSSA website to inform future research. It is envisioned that this database is updated every two years to create a living database of local and African emergency care research.

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