

Strengthening pre-hospital clinical practice guideline development for South Africa

Michael Gilbert McCaul

Dissertation presented for the Degree of Doctor of Philosophy (PhD)
in Public Health in the Faculty of Medicine and Health Sciences at
Stellenbosch University



Primary Supervisor: Prof Mike Clarke

Co-supervisors: Prof Taryn Young, Prof Stevan Bruijns

December 2020

Declaration

By submitting this dissertation electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date: 8 July 2020

Abstract

In 2016, the first evidence-based prehospital clinical practice guideline was developed for South African paramedics, replacing outdated and eminence-based practice protocols. Rather than *de novo* development, alternative methods were used to develop these guidelines. These methods, however, require further strengthening and there is a modest gap in the literature regarding such methods. This strengthening would make it possible to address issues in current and future guideline development and implementation practices in South Africa and beyond, especially in resource-limited settings. Issues include poor guideline quality and lack of appropriate methods, especially in prehospital care. In this thesis, I explore how to strengthen prehospital clinical practice guideline (CPG) development and implementation in low-resource settings.

Using the African Federation for Emergency Medicine (AFEM) prehospital CPG as a case study, I used various research methods to i) identify, map and appraise global and regional prehospital guidelines (via a descriptive study and a scoping review); ii) describe and strengthen guideline development methods (via a qualitative case study, an expert review and a critical reflection/report); and iii) identify guideline implementation challenges and solutions (via a qualitative implementation research study).

I show that overall, both global and regional (African) prehospital guidance quality is poor; however, an existing pool of high-quality CPGs can be adapted to fit national and local settings. I identify guideline development and implementation challenges within the AFEM guideline project and provide solutions and linked priority actions for guideline stakeholders. Considering these results, I have produced an alternative guideline development roadmap for prehospital guideline development in South Africa and beyond.

This PhD argues that in order to strengthen existing and future prehospital CPG and end-user products, I suggest developers use existing high-quality guidelines, together with national policy and evidence to support context-specific recommendations. I argue that when developing and implementing guidelines, careful consideration of conflicts of interest during implementation decisions must be considered, together with ensuring wide and open consultation with stakeholders. To support robust development, I provide a critical report and roadmap for guideline development producers in resource-limited settings. This PhD highlights implications for future research, including the need to determine the cost-effectiveness of alternative versus *de novo* methods, identify prehospital topics with the greatest impact where CPGs are lacking, exploring the roles, need and objectives of policy-makers in prehospital guideline development, and testing and evaluating methods of dealing with consolidating multiple conflicting CPG recommendations and levels of evidence.

Abstrak

In 2016 is die eerste bewysgebaseerde voorhospitaalse kliniese praktykrylyn vir Suid-Afrikaanse paramedici ontwikkel, wat verouderde en vooropgestel-gebaseerde praktykprotokolle vervang. Alternatiewe bewysgebaseerde metodes is gebruik om hierdie riglyne te ontwikkel. Hierdie metodes wys 'n beskeie leemte in die literatuur en vereis verdere versterking. Dit is nodig om huidige en toekomstige riglyne vir die ontwikkeling en implementering van riglyne aan te spreek - wat swak riglynkwaliteit en 'n gebrek aan toepaslike metodes in voorhospitaalse sorg insluit - in Suid-Afrika en verder, veral in omgewings met beperkte hulpbronne. In hierdie tesis ondersoek ek hoe om die ontwikkeling en implementering van voorhospitaalse kliniese riglyne (VKR) vir die kliniese praktyk in lae-hulpbronomgewing te versterk.

Met behulp van die "African Federation for Emergency Medicine (AFEM)" voorhospitaalse kliniese riglyne as 'n gevallestudie, het ek verskillende navorsingsmetodes gebruik om i) globale en streeks voorhospitaalse riglyne te identifiseer, te karteer en te beoordeel (via beskrywende studie en bestekopname); ii) riglyne-ontwikkelingsmetodes te beskryf en te versterk (via kwalitatiewe gevallestudie, kundige oorsig en kritiese besinning / verslagdoening); en iii) riglyne vir implementerings uitdagings en -oplossings (via kwalitatiewe implementeringsnavorsing) te identifiseer.

Ek toon aan dat die globale sowel as streeks- (Afrika-) voorhospitaalse voorligtingkwaliteit oor die algemeen swak is; 'n bestaande poel hoë-gehalte-kliniese riglyne kan egter aangepas word om by die plaaslike instellings te pas. Ek identifiseer riglyne-ontwikkeling en implementeringsuitdagings binne die AFEM-riglynprojek en bied oplossings en gekoppelde prioriteitsaksies vir belanghebbendes. As ek hierdie resultate in ag neem, het ek 'n alternatiewe riglyn vir die ontwikkeling van riglyne vir voorhospitaalse riglyne in Suid-Afrika en verder opgestel.

Hierdie PhD argumenteer dat, ten einde die bestaande en toekomstige VKR en eindgebruikersprodukte te bevorder, voorstel ek dat ontwikkelaars bestaande riglyne van hoë gehalte gebruik, saam met die plaaslike beleid en bewyse om konteksspesifieke aanbevelings te ondersteun. Ek argumenteer dat by die opstel en implementering van riglyne, noukeurige oorweging van belangebotsings tydens implementeringsbesluite oorweeg moet word, tesame met die versekering van 'n wye en oop konsultasie met belanghebbendes. Om robuuste ontwikkeling te ondersteun, bied ek 'n kritiese verslag en 'n padkaart vir produsente wat riglyne ontwikkel in hulpbronbeperkte omgewings. Hierdie PhD beklemtoon implikasies vir toekomstige navorsing, met inbegrip van die noodsaaklikheid om die koste-effektiwiteit van alternatiewe teenoor *de novo*-metodes te bepaal, voorhospitaalse onderwerpe te identifiseer wat die grootste impak het waar riglyne ontbreek, die rol, behoefte en doelstellings van beleidmakers in die ontwikkeling van voorhospitaalse ondersoek, en metodes om die konsolidering van verskeie teenstrydige riglyne - aanbevelings en bewyse te toets en te evalueer.

Dedications and acknowledgements

I am both a researcher, academic, father and theist. Thus, in relation to the latter, I would like to thank God for giving us the drive to want to discover the world's mysteries.

To my wife, Jeannie, for her unwavering support, who somehow got through specialising in orthopaedics, having a baby and being the mother she is today, all throughout my PhD. Also, for helping me with The English Language.

To Johanna, my daughter, for all the days you cried and wanted me back on weekends while I was writing. This I have done for you too.

To friends and family, for supporting us, over weekends and during the week. Acknowledging Etha and Elizabeth, for their sacrifice.

To my supervisors, Mike, Taryn and Stevan. Thank you for your guidance, dedication and knowledge which was given so freely. Thank you for developing my agency to pursue creative risks, independence of thought, and supporting my autonomy. I have learnt so much from all of you and trust I will be able to guide as you did. A special thanks to Taryn for helping me with protected time to complete this endeavour.

To my mentor, Karen, for being part of my family, for asking hard questions and challenging me beyond the PhD. You have done invisible and often unrecognised work, you have given of yourself without question, and sown into the next generation of research leaders.

To the PhD discussion group, led by Susan van Schalkwyk, for sharing in my triumphs and frustrations and facilitating space to reflect and grow from Doctoral student to where I am today.

To Jason, for being an epic brother and editing.

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Abbreviations

AFEM – African Federation for Emergency Medicine

AGREE II – Appraisal of Guideline Research and Evaluation

CEBHC – Centre for Evidence-based Health Care

CPG – Clinical practice guideline

EMS – Emergency medical services

G-I-N – Guidelines International Network

GRADE – Grading of Recommendations Assessments, Development and Evaluation

GUIDE-M – Guideline Implementability for Decision Excellence Model

HPCSA – Health Professions Council of South Africa

iCAHE – International Centre for Allied Health Evidence

ICMJE – International Committee of Medical Journal Editors

KT – Knowledge translation

LMIC – Low- and middle-income countries

NDoH – National Department of Health

NECET – National Emergency Care Education and Training Committee

NICE– National Institute for Health and Care Excellence

PBEC – Professional Board of Emergency Care

SAGE – South African Guidelines Excellence Project

WHO – World Health Organisation

Definition of terms

Prehospital care	<p>Refers to out-of-hospital emergency care delivered by a professional provider with the ability to provide transport to a healthcare facility.</p> <p>Source: https://www.sciencedirect.com/science/article/pii/S2211419X14000330</p>
Out-of-hospital emergency care	<p>Defined as a suitable umbrella term for use in Africa which refers to the full spectrum of emergency care that occurs outside healthcare facilities. This broadly includes care delivered by both laypersons and professional responders.</p> <p>Source: https://www.sciencedirect.com/science/article/pii/S2211419X14000330</p>
Emergency medical services	<p>Emergency medical services refers to formalised prehospital care, provided by emergency care professionals who respond to medical emergencies within a well-defined jurisdiction. EMS refers to an established entity, agency or system, which is appropriately integrated into the existing out-of-hospital emergency care (OHEC) and facility-based healthcare system, thereby facilitating the coordinated, timely, and safe provision of emergency care and transportation to the most appropriate healthcare facility.</p> <p>Source: https://www.sciencedirect.com/science/article/pii/S2211419X14000330</p>
Clinical practice guideline	<p>The Institute of Medicine defines clinical practice guidelines as "statements that include recommendations, intended to optimise patient care, that are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative care options".</p> <p>Source: Consensus report, Institute of Medicine. Clinical practice guidelines we can trust. March 23, 2011. https://www.ncbi.nlm.nih.gov/books/NBK209539/</p>
Emergency care	<p>Refers to any care provided in an emergency or acute setting. Includes prehospital care or in-hospital care.</p> <p>Source: https://www.sciencedirect.com/science/article/pii/S2211419X14000330</p>
Low- to middle-income country	<p>An ordinal classification system that groups countries by income level according to the World Bank.</p> <p>Source: https://blogs.worldbank.org/opendata/new-country-classifications-income-level-2019-2020</p>
<i>De novo</i>	<p>To start from the beginning. In this thesis, referring often to <i>de novo</i> guideline development. Referring to developing a guideline from the beginning.</p> <p>Source: https://medical-dictionary.thefreedictionary.com/de+novo</p>
Alternative guideline development	<p>A broad term referring to a guideline development process that uses existing evidence to inform decisions or evidence and does not start <i>de novo</i>.</p>
Health Professions	<p>The HPCSA, together with the 12 professional boards under its ambit, is established to provide for control over the education, training and registration</p>

Council of South Africa	<p>for practising of health professions registered under the Health Professions Act in South Africa.</p> <p>Source: https://www.hpcsa.co.za/?contentId=463&actionName=About%20Us</p>
Professional Board of Emergency Care	<p>The Professional Board of Emergency Care is the regulator authority, as part of the HPCSA, for prehospital providers and care in South Africa.</p> <p>Source: https://www.hpcsa.co.za/?contentId=0&menuSubId=45&actionName=Professional%20Boards</p>
Systematic review	<p>A review in which bias has been reduced by the systematic identification, appraisal, synthesis, and, if relevant, statistical aggregation of all relevant studies on a specific topic according to a predetermined and explicit method.</p> <p>Source: https://www.cochrane.org/news/what-are-systematic-reviews and Moher et al. Lancet 1999; 354: 1896-900</p>
African Federation for Emergency Medicine	<p>The African Federation for Emergency Medicine is an international coordinating consortium of African national emergency medicine organisations.</p> <p>Source: https://en.wikipedia.org/wiki/African_Federation_for_Emergency_Medicine</p>

Chapter 1: Introduction

Background

In 2016, the first evidence-based prehospital clinical practice guideline was developed for South African paramedics, replacing outdated and eminence-based practice protocols. Rather than *de novo* development, alternative methods were used to develop these guidelines. These methods, however, require further strengthening and there is a modest gap in literature regarding such methods. This strengthening would make it possible to address issues in current and future guideline development and implementation practices in South Africa and beyond, especially in resource-limited settings. Issues include poor guideline quality and lack of appropriate methods, especially in prehospital care. In this thesis, I explore how to strengthen prehospital clinical practice guideline (CPG) development and implementation in low-resource settings.

In this thesis I explore how to strengthen prehospital CPG development and implementation in low-resource settings. I do this by answering the research question of what the process is of developing and implementing a South African CPG for prehospital providers and how this can be strengthened.

Guideline terminology

CPGs are an essential instrument for high-quality medical practice and a key vehicle in getting evidence into policy and practice. However, what classifies as a guideline varies and, as Kredo *et al.* (2016) note, there is a global need for consensus on guidelines and related terminology¹. This is especially true for the South African prehospital setting where guidelines, CPGs, care pathways and protocols are all common terms and are often referred to as though they are the same² (see Table 1-1). However, they are not the same and a clear distinction should be made between these labels. Guidelines relate to broad issues typically found in government structures or even primary health care (e.g. global warming, food security and water or air quality). CPGs focus on health aspects, dealing with specific conditions or symptoms, and are used mostly by health care professionals or clinical managers. Protocols and care pathways refer to documents which relay strict instructions for performing certain procedures, managing particular conditions or indicating treatment flows, often visually via a treatment or pathway algorithm.

The definition of a CPG was updated in 2011 by the Institute of Medicine (IOM) from focusing solely on patient care to requiring rigorous methodology in the guideline development process: 'Clinical guidelines are statements that include recommendations intended to optimise patient care that are informed by a *systematic review of evidence* [italics added] and an assessment of the benefits and harms of alternative care options'³. CPGs are thus documents that should be based on the synthesis of the best available evidence, presented as clear and unambiguous recommendations for healthcare users, policy-makers and clinicians. Protocols are more focused and prescriptive, specifically in the South African prehospital setting, because they are specific step-by-step instructions typically describing processes that are non-negotiable and set in stone. Ideally, protocols should emanate from high-quality CPGs with rigorous evidence-based methodology.

Table 1-1: Description of guideline related terms

Guideline related term	General definition
Clinical practice guideline	As the above IOM definition. Documents where recommendations have been informed by a synthesis of the best-available evidence to inform clinical practice.
Care pathway	Synonymous with algorithms, typically depicting a patient flow or process within a healthcare system or clinical scenario.
Protocol	Documents that provide step-by-step guidance on how to do specific tasks, typically linked to a clinical skill (e.g. the steps of doing a primary survey). Protocols may or may not be based on parent (source) clinical practice guidelines.
Algorithm	Synonymous with clinical decision tools, where clinical decisions or options are mapped out in an algorithm for clinician ease of decision making. Like protocols, may or may not be based on parent clinical practice guidelines.

Unfortunately, this has not been the case for clinical *guidance* development (such as protocols or algorithms) in South African emergency care as no CPGs have existed for the past two decades⁴. The programme of research presented in this thesis draws on recent prehospital CPG development efforts to improve the situation, by studying the recent guideline development and implementation processes. However, one first needs to understand the prehospital emergency care context and status of prehospital guidance in South Africa in order to promote and strengthen guideline development and implementation processes.

Prehospital emergency care and clinical practice guidelines context in South Africa

The Health Professions Council of South Africa Professional Board of Emergency Care (HPCSA PBEC) guides and regulates the emergency care profession regarding registration, education, training, and professional conduct, as per the Health Professions Act of 1974. To date, emergency care clinical practice has been guided by protocols and documents providing clinical practice instructions, last revised in 2006 and 2009⁵⁻⁷. With unclear and outdated evidence underpinning the protocols, the PBEC initiated the revision of the protocols in August 2015⁴. The African Federation for Emergency Medicine (AFEM), collaborating with researchers and emergency care specialists, was awarded the bid to revise and reformulate the protocols using best evidence in late 2015 by developing a prehospital CPG.

The AFEM used alternative guideline development methods, where existing up-to-date high-quality CPGs, rather than primary evidence, were synthesised and either adopted, adapted or contextualised to the national setting. This led to the production of the first evidence-based CPG for the emergency care profession in Africa⁸. The CPG culminated in a document with over 1000 recommendations for South African emergency care clinical practice, aligned to national contextual factors. CPGs such as this represent a transition from skills-driven (protocolised clinical practice) practice underpinned by expert opinion, to practice that is informed by the best available evidence. Further details around guideline methods and challenges have been reported elsewhere⁹. Since the first submission of the CPG to the HPCSA PBEC in middle 2016¹⁰, the CPG has undergone public comment, including input from the National Department of Health (NDoH), higher education institutions, other regulatory bodies, and most importantly the guideline end-users. It was officially ratified and released for implementation in December 2018¹¹.

The CPG were well received by the majority of prehospital providers, prehospital organisations and educational institutions as it updated old practices, introduced new interventions and removed harmful ones. However, the CPG have also been met with fierce resistance, mostly from short course qualified prehospital providers. This surfaced from social media and blogs¹² as the recommendations

and inferred updated scope of practice for providers has vast implications for emergency care service delivery, training, and by extension, curriculum alignment for a total of seven different qualification registries, affecting approximately 70,000 registered providers¹³. Some implications are considered positive (e.g. access to effective treatments previously unavailable), others are considered negative (e.g. narrowing the scope of practice for some providers¹⁴). This creates a particular challenge for local or national prehospital guideline development teams, as the guideline end-users are not a homogenous group of providers, making developing and implementing recommendations challenging, especially in a shifting implementation context. However, overall the new emergency care guidelines have brought change and discourse to prehospital care in South Africa. This is partially due to a South African emergency medical services (EMS) prehospital qualification framework that is complex, with prehospital training ranging from three weeks to four years.

The current status quo of prehospital providers is a mix of different qualifications ranging from basic life support to highly trained practitioners with a variety of skills, knowledge and tools to perform advanced emergency care and rescue. The majority of EMS providers have four-week (basic ambulance assistant) and three-month (intermediate life support ambulance emergency assistant) qualifications. Currently the four-week, nine-month and two-year National Certificate courses have been phased out, and the three-month and three-year National Diploma courses are being phased out, as the industry transitions to professionalise emergency care providers away from skills-based short course training programmes, adding to a challenging and shifting guideline implementation context. The South African EMS has seen rapid growth over the past two decades. It has developed from basic certificate courses to professional undergraduate degrees, including postgraduate Masters and PhD programmes. The current trajectory is moving towards a three-tiered qualification system, namely emergency care assistant, emergency care technician and emergency care provider, similar to nursing (Table 1-1). However, to add to the qualification complexity, there are three tiers of advanced life support providers, encompassing an additional five qualifications, some of which are still in existence.

Table 1-2: Overview of South African prehospital provider qualifications

Provider Level	Duration	Qualification Name	Registration Category
*Basic Life Support	4 week course	Basic Ambulance Assistant	Basic Ambulance Assistant
*Intermediate Life Support	3 month course	Ambulance Emergency Assistant	Ambulance Emergency Assistant
Emergency Care Assistant	1 year Diploma	Emergency Care Assistant	Emergency Care Assistant
Advanced Life Support	*9 month certificate course	Critical Care Assistant	Paramedic
	*3 year Diploma	National Diploma	
	2 year Diploma	National Diploma	Emergency Care Technician
	4 year BSc Degree or *3 year National Diploma with an optional 1-year Bachelor of Technology	Professional Bachelor's Degree	Emergency Care Practitioner

*Indicates courses or qualifications being phased out.

Considering this shifting implementation context and industry qualification changes in the near future, the successful dissemination and implementation of the guidelines have been referred to as the '*biggest challenge yet*' facing South African emergency care⁸, as emergency care policy, curriculum, approval of new medicines, training of providers and industry responds to change. With this in mind, a key vehicle in advancing South African prehospital clinical care is investing in the strengthening of the development and implementation of prehospital CPGs now, and for the foreseeable future.

Considering the South African AFEM guidelines were developed by AFEM using existing high-quality CPGs, a first step would be to identify and scope all available emergency care CPGs worldwide, specifically to inform guideline development teams (either local teams or national teams, in or outside of South Africa) about what has been done and potentially negate reinventing the wheel in producing guidelines from scratch. However, no systematic or scoping review has been published exploring the availability of high-quality CPGs for emergency care, a substantive gap in the literature that this PhD aims to address.

Quality of emergency care clinical practice guidelines – where are we now?

Concerns have been raised regarding the quality of CPGs, specifically guidelines developed by professional societies¹⁵. The need for critical appraisal of guidelines has been emphasised and various tools to grade the quality of CPGs have been developed and validated¹⁶. Those of note include the Appraisal of Guideline ResEarch and Evaluation (AGREE II) instrument developed in 2010, the RIGHT statement¹⁷ developed in 2017 and the International Centre for Allied Health Evidence (iCAHE) tool for judging guideline quality developed in 2014^{18,19}. These and other tools have been used to assess the quality of CPGs in various settings, including lung cancer, hypertension and head injuries, but evidence is lacking regarding the quality of existing prehospital CPGs²⁰⁻²².

Globally, research around the quality and availability of prehospital CPGs is severely lacking. Hoogmartens *et al.* (2013) appraised the completeness and level of evidence behind recommendations in prehospital guidelines of traumatic brain injury and noted large content variation in the prehospital recommendations²³. They did not attempt to critically appraise the quality of the included guidelines, which might have helped to explain the heterogeneous results. Closer to South Africa, Wilkinson *et al.* (2018) conducted a scoping review of South African CPGs, taking a broad definition of what a guideline is, which included protocols, position statements or poster/algorithms and described items associated as surrogate measures of guideline quality²⁴. For emergency medicine, they found no CPGs, only algorithms and posters related to in-hospital emergency medicine treatment. Therefore, given the lack of appraisals similar to those done in other areas of health care, the quality of prehospital emergency care CPGs remains largely unknown, both globally and nationally within South Africa.

As guideline development teams seek to prioritise high-quality CPGs to adapt, adopt or contextualize for their settings^{25,26}, there is a clear rationale for an appraisal of the existing body of emergency care guidelines globally so that new guideline teams can be better informed, likely through secondary research such as scoping reviews or describing existing databases. Furthermore, CPGs, irrespective of whether or not they are based on high-quality evidence (from other CPGs, systematic reviews or primary studies), still need to be presented to clinicians in a usable format, as an appropriate end-user document²⁷.

Clinical practice guideline development for emergency care

Clinical practice guideline development is well established and has over the past decade shifted from being based mainly on expert opinion to focus on using the best available evidence, primarily prepared by research methodologists¹. Organisations such as the Guidelines International Network (G-I-N) and the National Institute for Health and Care Excellence (NICE) have made major strides in standardising CPG writing across countries. Resources and handbooks exist that can guide guideline developers in developing, appraising, implementing and evaluating CPGs^{3,28}.

Clinical practice guideline development is underpinned by the systematic searching and synthesis of the best available evidence, usually through systematic reviews. This synthesis can either be done at primary level evidence, termed *de novo* development²⁹, or through alternative methods such as adopting, adapting and contextualizing²⁶ existing high-quality CPGs. *De novo* development is a long and expensive endeavour and often out of reach of guideline teams with limited funding or who are not connected to substantive guideline development agencies. Kredo *et al.* (2016) argues that there seems little merit in developing new guidelines (unless there is a true gap in guidance) when there is a wealth of freely accessible, good quality CPGs available that can be adopted directly or adapted and contextualised to local needs¹. A variety of different alternative guideline development methods exist, some of which use Grading of Recommendations Assessments, Development and Evaluation (GRADE) to adapt guidelines, termed adoption³⁰, while other methods accelerate certain steps in the guideline development process³¹⁻³⁵. Darzi *et al.* (2017) identified up to eight proposed frameworks for guideline adaptation of health related guidelines³⁶, while Wang, Norris and Bero (2018) highlighted there are still various gaps in knowledge about guideline adaptation, specifically in low- to middle-income countries, where these frameworks have not been formally evaluated³⁷. They advocate studies of guideline adaptation in low- and middle-income countries (LMIC), expanding the barriers and facilitators of adaptive guideline development and implementation and, among others, exploring pragmatic and efficient processes in alternative guideline development and implementation.

The process of *de novo* guideline development has been well described^{38,39}, together with some methods and examples of adapting existing CPGs to local settings^{25,40,41}, but gaps still exist, with few examples reflecting on current methods. A paper by Grimmer *et al.* (2018), describing the process of standardising evidence strength grading for recommendations from multiple CPGs, has been a valuable injection into alternative guideline development methods. Described as a case study,

although similar to a research report and reflection, the authors report on the process of producing an allied health stroke rehabilitation guideline, and acknowledge that these methods should further be tested and validated in similar projects⁴⁰. Furthermore, it has been mentioned that CPGs are not always taken into account by African guideline development groups and a shift to adopting, adapting and contextualising CPGs as an emerging methodology could prove helpful to developing emergency care guidelines in South Africa and other LMICs where large funding agencies are scarce⁴²⁻⁴⁴. However, these methods and CPG processes are yet to be developed and tested in such countries, and specifically for emergency care in Africa, a current contextual evidence gap this PhD aims to address.

Guidance documents in emergency care range from extensive international resuscitation guidelines⁴⁵ and professional society guidelines⁴⁶ to national protocols or even local end-user documents (e.g. Emergency Medicine Society of South Africa practice guidelines)⁴⁷. The methods used to develop emergency care guidelines might also vary, with some groups using systematic searching and established evidence synthesis methods^{29,48} while the methods used by others are unclear⁴⁹. Against this backdrop, therefore, there is a need to promote and develop clear and transparent methods for guideline development for prehospital care for the South African and African settings, especially considering the lack of funding and time restraints faced by guideline teams⁴.

Guideline implementation

The World Health Organisation (WHO) acknowledges that one of the greatest challenges in global health is how to effectively transition evidence into the real world⁵⁰. Thus, the task of implementing guidelines is as important as developing the guidelines themselves. Globally, an important consideration for maximising the clinical impact and implementation of CPGs is an assessment of barriers and perceptions of the target users⁵⁰, but relevant evidence is currently lacking for prehospital care in resource-constrained settings^{51,52}. Decision makers, including industry service providers (e.g. ER24 or public ambulance services), the NDoH, regulators and training institutions need to be aware of the perceptions, experiences, challenges and solutions expressed by prehospital providers for guideline implementation and dissemination in order to strengthen guideline uptake and have lasting impact on patient outcomes. In fact, stakeholder engagement is considered an essential component of CPG development and implementation; however, evidence is lacking on how to best go about including their views practically, as noted by Petkovic *et al.* (2020)⁵³.

In order to strengthen guideline implementation in the South African emergency care setting, decision makers need to understand prehospital providers' experiences and challenges of guideline implementation and dissemination. Such research is an important first step and has been applied in various other settings. In nursing, for example, Kredo *et al.* (2017) sought to explore the perspectives of national stakeholders for primary care CPGs and identified both strengths and gaps in the CPG development processes, and the need for national standards to guide CPG development and implementation⁵⁴. Various systematic reviews have been conducted, providing variable evidence on which interventions and strategies are effective, ineffective and variably effective in implementing CPGs^{55,56}. In this case, an overview of reviews (including 25 moderate to strong quality systematic reviews) concluded multifaceted interventions compared to single-component interventions are no more effective at changing health-care professionals' behaviours, contrary to face value⁵⁷.

Ineffective forms of guideline implementation include passive educational approaches such as lectures, continuing medical education (a mixture of passive and active) and simply publishing guidelines. These approaches may well raise awareness, but are generally ineffective in changing provider behaviour⁵⁸. These passive dissemination and implementation strategies are a good first step in creating awareness, but the desired strategy for any guideline should be based on dissemination and implementation strategies that have been shown to be effective, including an assessment of barriers⁵⁹. Variably effective strategies include audit and feedback and using opinion leaders^{60,61}. Additionally, to increase guideline uptake, there is a range of tools guideline producers

can develop additional to simply producing a guideline, such as training workshops, end-user documents, reminders or web-based tools. However, the effectiveness of these tools remains unclear, but probably more effective than just producing a guideline on its own⁶². Unfortunately, little to no evidence exists around barriers to, facilitators of, or perspectives on guideline implementation and dissemination for prehospital care, specifically in South Africa, a substantial contextual evidence gap.

Problem statement

Limited evidence exists to inform alternative guideline development methods in LMICs³⁷ – specifically so in prehospital care – a considerable contextual gap in scholarship. Furthermore, the availability and quality of prehospital care guidelines is still unknown, placing alternative guidelines developers at a significant disadvantage, as they are reliant on existing evidence. In order to provide evidence-based prehospital guidance, especially in resource-limited countries, including South Africa, it is essential to i) assess the current quality and characteristics of all emergency care guidelines; ii) identify existing guidance gaps and develop methods for clinical practice guideline development, specifically methods that are cost-effective, time-saving and robust, and that are suited to the local or national context; and iii) ensure guideline development be accompanied by clear implementation evidence, which is another challenge for emergency care in South Africa.

This PhD is nested within the AFEM emergency care clinical practice guideline project conducted in 2016, collaborating with the Centre for Evidence-based Health Care (Stellenbosch University) (CEBHC), the Department of Emergency Medical Sciences (Cape Peninsula University of Technology), and Emergency Medicine (University of Cape Town). As noted above, the AFEM project produced a prehospital clinical practice guideline (for a variety of prehospital topics) and drafted an end-user guidance document example for review by the HPCSA PBEC. I was a core guideline panellist in this project and played a pivotal role in the development of these emergency care CPG. This also places me in an ideal position to consider key questions for prehospital guideline development to address current and future guideline development challenges.

Study Objectives

Overarching research question

What is the process of developing and implementing a South African clinical practice guideline for prehospital providers and how can this be strengthened?

Aim and objectives

The aim of this study is to strengthen methods for prehospital clinical practice guideline development and implementation for South Africa. It is a nested project within the AFEM CPG project set out by the HPCSA PBEC.

The objectives are:

1. **Chapter 2:** To describe and spatially map national and international prehospital emergency care CPG characteristics and quality that were produced between 2000 and 2016:
 - a. To describe available current prehospital emergency care CPGs relevant to guideline development teams
 - b. To map the spatial distribution of prehospital emergency care CPGs globally
 - c. To identify gaps in prehospital guideline development literature relative to key priority areas and to provide specific recommendations for future research
 - d. To describe the quality of prehospital emergency care CPGs worldwide
 - e. To identify gaps in reporting and methodology in prehospital CPGs
 - f. To provide insight and recommendations for improvement and future development of prehospital emergency care CPGs.

2. **Chapter 3:** To describe methods of developing CPGs for prehospital guideline development teams in LMICs by:
 - a. Reporting on methods developed during the AFEM clinical practice guideline project which include:
 - i. Searching methods for guidelines
 - ii. Mapping priority areas with guideline content and scope
 - iii. Adopting, adapting and contextualising existing CPG recommendations
 - iv. Handling guideline levels of evidence heterogeneity
 - b. Identifying lessons learnt, challenges, enablers and barriers in prehospital clinical practice guideline development teams from the AFEM clinical practice guideline project
 - c. Identifying and formulating practical solutions to challenges, problems and barriers applicable to LMICs
3. **Chapter 4:** To strengthen the described guideline development process by:
 - a. Describing the opinions of international guideline experts on the AFEM guideline project
 - b. Providing key considerations and approaches for alternative guideline development
 - c. Producing a guideline development framework for LMICs using alternative methods of guideline development
4. **Chapter 5:** To explore the perceptions of paramedics for the implementation and dissemination of CPGs in South Africa, to strengthen guideline uptake by:
 - a. Describing prehospital providers' experiences and perceptions of guideline implementation and dissemination
 - b. Identifying paramedic challenges and solutions to guideline uptake

Following the presentation of the research that meets these objectives through various published papers, the thesis concludes with chapters that summarise the overall findings, draw conclusions from this body of research and describe the resulting knowledge translation activities.

Scope of work

Phases of the study

This thesis consists of four phases (Chapters 2-5, Figure 1) and makes use of quantitative, qualitative and secondary research methods. The first phase is quantitative and uses secondary research, while the rest of the thesis uses a variety of qualitative research methods, ranging from case studies to qualitative descriptive research.

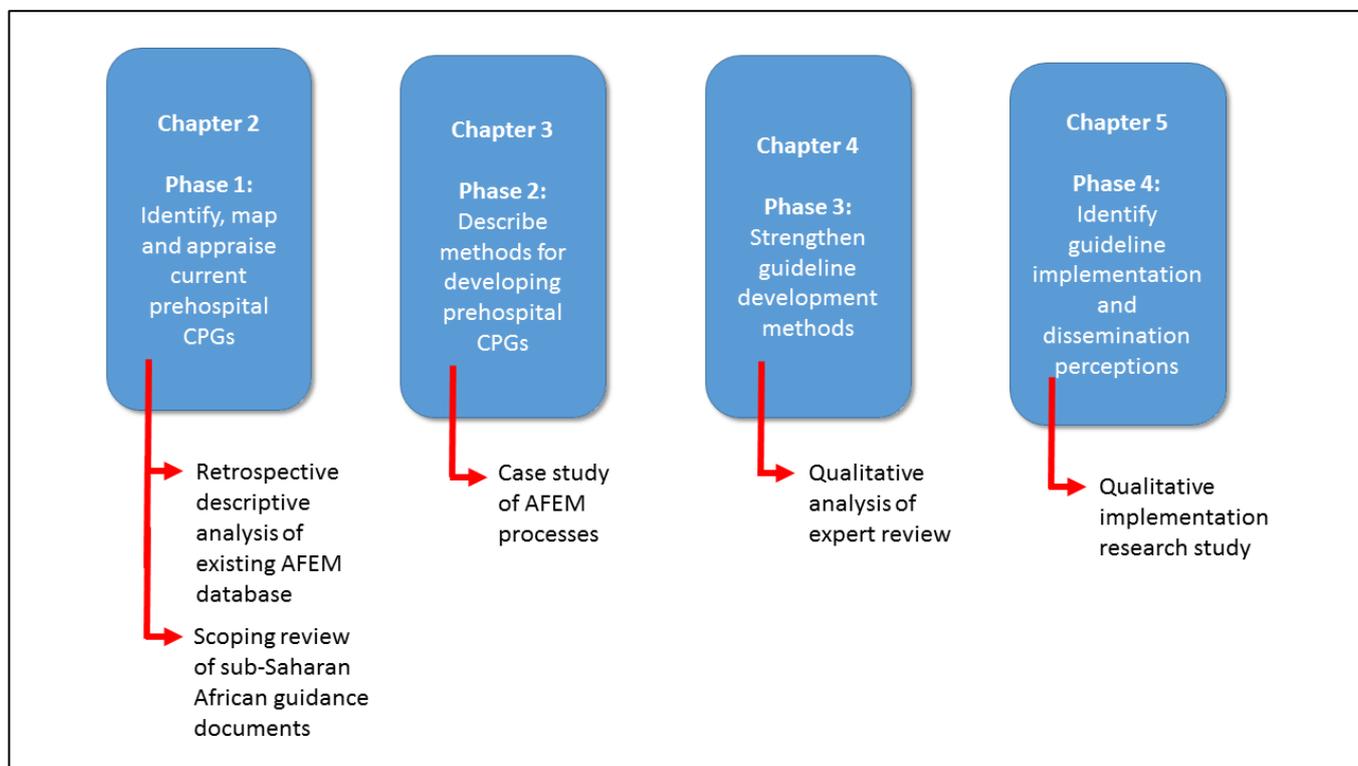


Figure 1 Overview of study phases

Overview of chapters

Table 1-2 provides an overview of the thesis chapters, with nested study phases. Chapter 1 provides a general introduction and overview of the study phases and methods, while Chapters 2 to 5 cover the individual and independent thesis phases seen in Figure 1. Each study phase is written as a stand-alone, publication-ready manuscript, and where already published, the original peer-reviewed paper is embedded. Chapter 6 summarises the overall findings of the previous chapters and discusses various relevant findings and results. Chapter 7 ties the thesis together in the conclusion. Chapter 8 provides an overview of the knowledge translation activities in the PhD. Appendices, linked publications and outputs follow the concluding chapter.

Table 1-2: Overview of PhD thesis chapters.

Chapter	Overview
Chapter 1	Short introduction to prehospital guideline development and the rationale and scope of work for conducting this research. Provides a succinct overview of past and current practices and challenges.
Chapter 2 (Phase 1)	A landscape analysis of global prehospital CPGs using a comprehensive guideline database and scoping review of sub-Saharan African prehospital guidance documents. Presents the current status and quality of guidelines globally and regionally.

Chapter 3 (Phase 2)	A qualitative case study of the AFEM prehospital guideline project conducted in 2016 using in-depth interviews and focus groups of key stakeholders. Describes processes, challenges and recommendations.
Chapter 4 (Phase 3)	A summary of commentary (expert review) by international guideline authorities of the Phase 2 and Phase 4 case studies towards developing a prehospital alternative guideline development roadmap.
Chapter 5 (Phase 4)	A qualitative descriptive study including focus groups of operational emergency care providers across four major provinces in South Africa. Explores guideline dissemination and implementation perceptions, barriers and recommendations for South African emergency medical services.
Chapter 6	An integrated discussion reflecting on the issues raised in the earlier chapters.
Chapter 7	Conclusion. Provides directions for future research, practice and policy that will strengthen prehospital clinical guideline development and implementation in South Africa and beyond.
Chapter 8	A description of the knowledge translation activities moving evidence from the PhD into policy and practice.

Ethical considerations

Ethical clearance was provided by Stellenbosch University before the commencement of this research (S17/03/069). Ethical clearance was not required for the secondary research using existing data or freely accessible data (i.e. Phase 1). Informed consent was obtained before any focus groups or interviews (Phases 2 to 4). Participation in the focus groups and in-depth interviews was voluntary and all information was kept strictly confidential. The participants and institutions involved have been anonymised by removing names and identifiers from the qualitative interview and focus group transcripts. All participants were informed of the aims and purpose of each qualitative study phase where relevant. This research is considered very low risk. Participants in Phase 3 were reimbursed at professional rates for their time according to (local) Stellenbosch University guidelines. Fortunately, this research was conducted before of the COVID-19 pandemic.

Appendices

Appendix 1. Link to the AFEM Clinical Practice Guideline (full version).

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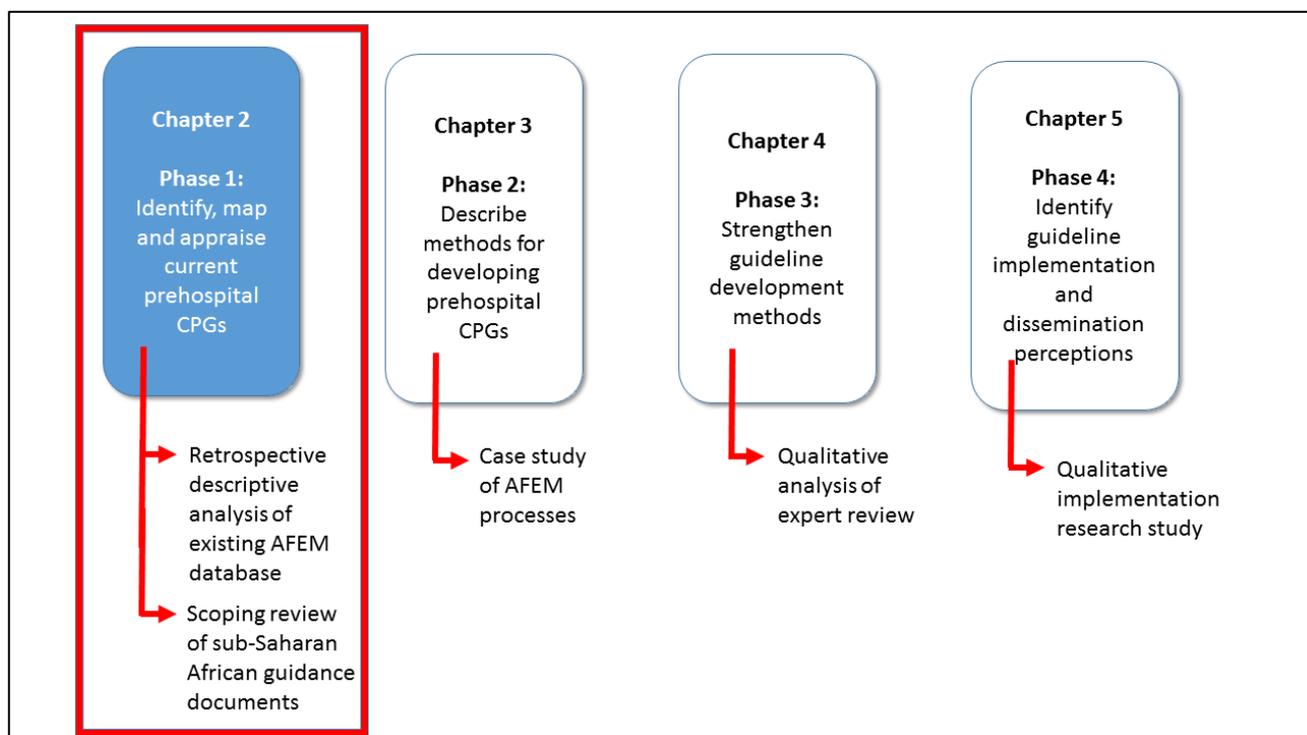
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Chapter 2: Identify, map and appraise current prehospital clinical practice guidelines

A landscape analysis of global emergency care clinical practice guidelines



Summary, publications and linked presentations

In this chapter I describe the characteristics and quality of global and national African prehospital guidelines, presented as two independent studies. This Chapter includes two linked publications: i) a descriptive study of a database of international CPGs relevant to emergency care produced by the African Federation for Emergency Medicine CPG project in 2016 led by myself and ii) a follow up project; a scoping review of prehospital guidance documents in sub-Saharan Africa, where I was the senior author.

Study 1: Landscape analysis of global emergency care CPGs

I aimed to describe the characteristics and quality of CPGs relevant to prehospital care worldwide, in order to strengthen guideline development in low-resource settings for emergency care.

I included CPGs as per the Institute of Medicine's guideline definition. A comprehensive search for CPGs was conducted in PubMed and Google including various guideline clearing house databases. Professional societies were contacted and websites searched for grey literature. End-user documents such as protocols, care pathways, and algorithms were excluded. Guideline quality was assessed with the AGREE II tool, by two researchers independently. Data were imported, managed, and analysed in STATA 14 and R. In total, 276 guidelines were included. Less than 2% of CPGs originated from LMICs; only 15% (n = 38) of guidelines were prehospital-specific, and there were no CPGs directly applicable to prehospital care in LMICs. Most guidelines used *de novo* methods (58%, n = 150) and were produced by professional societies or associations (63%, n = 164), with very few developed by international bodies (3%, n = 7). National bodies, such as the NICE and the Scottish Intercollegiate Guidelines Network, produced higher quality guidelines when compared to international guidelines, and those from professional societies, and clinician/academic groups. Guideline quality varied across topics, subpopulations and producers, but this review has shown that resource-constrained guideline

developers that cannot afford *de novo* guideline development do have access to an expanding pool of high-quality prehospital guidelines to translate to their local or national setting.

Although some high-quality CPGs exist relevant to emergency care, none directly address the needs of prehospital care in LMICs, especially in Africa. I highlight the importance for strengthening adaptive guideline development methods that use existing high-quality CPGs. Further research, such as guideline case studies, is required to showcase the pragmatic application of adaptive guideline development methods to strengthen guideline development in low-resource settings for prehospital care.

Study 2: Scoping review of prehospital guidance documents in sub-Saharan Africa

Due to the landscape analysis (Study 1) excluding any guidance documents other than CPGs, and the significant lack of prehospital CPGs available in Africa, I conducted a follow up study in 2019. This scoping review aimed to describe and appraise all prehospital-relevant guidance documents (in the broadest sense) in sub-Saharan Africa to inform clinical guideline development in sub-Saharan Africa for prehospital care.

I conducted a comprehensive and broad search of formal databases (PubMed and Scopus) and guideline clearing houses (such as G-I-N and Trip databases) and Google Scholar. Considering the lack of formal CPGs in Africa, I also searched grey literature including prehospital journals, society websites, hand searched conference proceedings, and contacted key authors in the field. Two authors, independently, and in duplicate, screened titles and abstracts and extracted data of included guidance documents using a pre-piloted data extraction form. Guidance quality was assessed using the AGREE II independently and in duplicate by four authors. Data were imported and analysed in STATA 16 using descriptive statistics. In total, after screening 1934 titles and abstracts, 51 guidance documents were included in this review from 13 countries. Ranked, South Africa produced the largest portion of guidance documents at 61% (n=31), followed by Kenya (8%) and Tanzania (6%). The majority of guidance documents were algorithms (37%, n=19), while 29% (n=15) were CPGs followed by review documents and clinical protocols. Overall, the guidance quality was poor, with methodological rigour scoring very low compared to stronger domains such as clarity of presentation. More than half (59%, n=30) of the guidance documents were produced by professional societies (e.g. AFEM or The South African Trauma Society), while national departments of health and clinicians/academics produced 22% (n=11) and 20% (n=10) respectively, with international organisations contributing only one guidance document. Additionally, overall guideline quality differed significantly between guideline producers ($p < 0.05$).

This scoping review included 51 guidance documents unidentified by the landscape analysis (Study 1) – all from sub-Saharan Africa – addressing a significant contextual gap for African guideline developers. By utilising a broad definition of guidance documents and revealing guidance documents missed previously the scene is set for further strengthening guidance efforts and reporting in sub-Saharan Africa for prehospital care. The majority of prehospital clinical guidance from sub-Saharan Africa provides clinicians with excellent ready-to-use end-user material. Conversely, most lack an appropriate evidence foundation and fail to transparently report the guidance development process, highlighting the need to strengthen and build guideline development capacity to promote the transition from eminence-based to evidence-based guidance for prehospital care in sub-Saharan Africa. Guideline developers, professional societies and publishers need to be aware of international and national guidance document development and reporting standards in order to produce guidance we can trust.

PUBLICATIONS

1. **McCaul M**, Clarke M, Bruijns S, Hodkinson P, de Waal B, Pigoga J, Wallis L, Young T. Global emergency care clinical practice guidelines: A landscape analysis. *African Journal of Emergency Medicine*. Volume 8, Issue 4. 2018. Pages 158-163. ISSN 2211-419X
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African Journal of Emergency Medicine (<http://www.afjem.com/>), Impact Factor: 0.88, h-index: 12. Open Access. Ranked 4th regionally for citations and 2nd for views.

Author contributions: MM conceptualised the research idea, collected data, performed the analysis and wrote the first draft of the manuscript. TY, SB and MC provided oversight and supervision of the research. MM lead the searching and guideline appraisal. BdW, PH and JP were involved/contributed to guideline searching and appraisal. All authors contributed to writing the manuscript, approved the final version and met the International Committee of Medical Journal Editors (ICMJE) criteria for authorship.

2. Malherbe P, Smit P, Sharma K, **McCaul M**. Guidance we can trust? *African Journal of Emergency Medicine*. 2020. (submitted manuscript, post peer-review, currently with editor)

African Journal of Emergency Medicine (<http://www.afjem.com/>), Impact Factor: 0.88, h-index: 12. Open Access. Ranked 4th regionally for citations and 2nd for views.

Author contributions: MM conceptualised the research idea and supported PM, PS and KS in writing the manuscript. MM and PS provided input and guidance regarding scope, searching, methods, data collection and analysis. PM and KS searched and collected data, supported by MM and PS. PM, PS and KS all contributed to data collection, while all authors were involved with AGREE II scoring. MM contributed as supervisor, and PS as co-supervisor. All authors contributed to writing the manuscript, approved the final version and met the (ICMJE) criteria for authorship. MM was the senior and supervising author of this publication. The first author is an undergraduate student who required significant supervision and guidance through the research process.

LINKED PRESENTATIONS

McCaul M, Clarke M, Bruijns S, Hodkinson P, de Waal B, Pigoga J, Wallis L, Young T. Global emergency care clinical practice guidelines: A landscape analysis. G-I-N 2018, Manchester, UK (Poster presentation, International)

McCaul M, Clarke M, Bruijns S, Hodkinson P, de Waal B, Pigoga J, Wallis L, Young T. Global emergency care clinical practice guidelines: A landscape analysis. Stellenbosch University Academic Year Day. 2018. (Oral presentation, National)

Malherbe P, Smit P, Sharma K, **McCaul M**. Guidance we can trust? The status and quality of prehospital clinical guidance in sub-Saharan Africa: A scoping review. EMSSA November 2019. (Oral Presentation, National)

APPENDICES

Appendix 2.1 Social media engagement

Appendix 2.2 Poster presentation



ORIGINAL ARTICLE

Global emergency care clinical practice guidelines: A landscape analysis

Michael McCaul^{a,*}, Mike Clarke^{a,b}, Stevan R. Bruijns^c, Peter W. Hodkinson^c, Ben de Waal^d, Jennifer Pigoga^c, Lee A. Wallis^{c,e}, Taryn Young^a

^a Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Stellenbosch University, South Africa

^b Centre for Public Health, Queen's University Belfast, Northern Ireland, United Kingdom

^c Division of Emergency Medicine, University of Cape Town, South Africa

^d Department of Emergency Medical Sciences, Cape Peninsula University of Technology, South Africa

^e Division of Emergency Medicine, Stellenbosch University, South Africa



ARTICLE INFO

Keywords:

Emergency care
Prehospital
Guideline development
Scoping
Guideline quality

ABSTRACT

Introduction: An adaptive guideline development method, as opposed to a *de novo* guideline development, is dependent on access to existing high-quality up-to-date clinical practice guidelines (CPGs). We described the characteristics and quality of CPGs relevant to prehospital care worldwide, in order to strengthen guideline development in low-resource settings for emergency care.

Methods: We conducted a descriptive study of a database of international CPGs relevant to emergency care produced by the African Federation for Emergency Medicine (AFEM) CPG project in 2016. Guideline quality was assessed with the AGREE II tool, independently and in duplicate. End-user documents such as protocols, care pathways, and algorithms were excluded. Data were imported, managed, and analysed in STATA 14 and R.

Results: In total, 276 guidelines were included. Less than 2% of CPGs originated from low- and middle income-countries (LMICs); only 15% (n = 38) of guidelines were prehospital specific, and there were no CPGs directly applicable to prehospital care in LMICs. Most guidelines used *de novo* methods (58%, n = 150) and were produced by professional societies or associations (63%, n = 164), with the minority developed by international bodies (3%, n = 7). National bodies, such as the National Institute for Health and Care Excellence (NICE) and the Scottish Intercollegiate Guidelines Network (SIGN), produced higher quality guidelines when compared to international guidelines, professional societies, and clinician/academic-produced guidelines. Guideline quality varied across topics, subpopulations and producers. Resource-constrained guideline developers that cannot afford *de novo* guideline development have access to an expanding pool of high-quality prehospital guidelines to translate to their local setting.

Discussion: Although some high-quality CPGs exist relevant to emergency care, none directly address the needs of prehospital care in LMICs, especially in Africa. Strengthening guideline development capacity, including adaptive guideline development methods that use existing high-quality CPGs, is a priority.

African Relevance

- The new development of CPGs is expensive, time-consuming, and often out of reach for guideline groups in resource-poor settings.
- Alternative methods have been proposed that accelerate this process by adapting CPGs to a local setting.
- Alternative guideline development methods are dependent on existing high-quality up-to-date CPGs.
- Guideline developers need to be aware of the availability, content, gaps, and quality of emergency care CPGs.

Introduction

De novo development of clinical practice guidelines (CPGs) is well-developed and documented [1]. *De novo* CPG development involves setting research questions, searching and synthesising primary evidence using systematic methods, convening guideline panels, and developing locally appropriate recommendations. But because *de novo* development is often expensive and time consuming [2], these methods are often out of reach for guideline development groups in resource-poor settings. Alternative methods of guideline development have been proposed, some of which draw on existing high-quality CPGs to adapt,

Peer review under responsibility of African Federation for Emergency Medicine.

* Corresponding author.

E-mail address: mmccaul@sun.ac.za (M. McCaul).

<https://doi.org/10.1016/j.afjem.2018.09.002>

Received 23 May 2018; Accepted 11 September 2018

Available online 24 October 2018

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adopt, or contextualise these to a local setting [2,3]. Some methods accelerate or simply remove certain steps in the guideline development processes [4], while others combine aspects of *de novo* development with reggrading of existing evidence [5]. Some of the modified methods are not dependent on synthesising evidence from individual studies, such as by producing new systematic reviews, but on synthesising existing high-quality CPG documents. This makes the process more efficient than the *de novo* approach by not re-inventing or re-synthesising documents each time guidance is developed for a particular context. All methods are dependent on the scope, quality, and availability of existing up-to-date high-quality CPGs within a particular topic or context. Guideline developers, whether using *de novo* or adaptive methods, need to be aware of the availability, quality, content, and gaps of relevant existing guidelines, in order to inform current and future guideline development and reduce waste.

Acute care, specifically prehospital emergency care in low-resource settings such as South Africa, faces the above problems when considering CPGs. Resources are limited and often preclude *de novo* development, leading to guideline groups searching for adaptive methods to develop robust CPGs using work already done by others [6]. However, the availability, scope, and quality of existing CPGs need to be described and assessed so that guideline developers are better informed regarding what evidence is available to them.

To date, limited attempts have been made to describe the current state of CPGs applicable to prehospital emergency care in resource poor settings. In 2016, Machingaidze et al. assessed the quality and reporting of South African primary care CPGs and concluded that the methodological quality of guidelines was generally poor to moderate [7]. Closer to acute care, Hoogmartens et al. appraised the completeness and level of evidence behind recommendations in prehospital guidelines of traumatic brain injury and noted large content variation in the recommendations [8]. They did not attempt to appraise the quality of the included guidelines, which might have helped to explain the heterogeneous results. Furthermore, a similar landscape study exploring South African protocols and end-user documents highlighted the lack of emergency care guidance available in South Africa [9].

As emergency care is expanding throughout low- and middle-income countries, guideline development teams are seeking to identify high-quality CPGs to adapt, adopt or contextualise for use in local settings [10], or use other methods to prepare CPGs to guide their practice. Given this, there is a need for the description, assessment, and appraisal of emergency care guidelines globally, so that these teams can be better informed of the existing body of evidence. This should help them to streamline their guideline development processes and to prepare their CPGs as efficiently and effectively as possible.

In 2015, the Health Professions Council of South Africa (HPCSA) Professional Board of Emergency Care (PBEC) sought to revise the national emergency care protocols at the time and partnered with the African Federation for Emergency Medicine (AFEM) for this project. AFEM collaborated with the Centre for Evidence-based Health Care (Stellenbosch University) and the Department of Emergency Medical Sciences (Cape Peninsula University of Technology) [6] and, in early 2016, the working group produced the first African evidence-based CPG for prehospital emergency care providers [11]. The AFEM CPG development project used an adaptive guideline development approach to *de novo* development, by adopting, adapting, or contextualising existing high-quality CPGs to produce contextually appropriate recommendations for emergency care in South Africa. An overview of the project, lessons learned, and experiences are reported elsewhere [12]. Its scope was extensive, including key identified emergency care topics such as acute coronary syndromes, airway, adult and paediatric and neonatal resuscitation, cerebrovascular accidents, environmental emergencies, fever, obstetrics and gynaecology, paediatric gastroenteritis, pain and procedural sedation, respiratory emergencies, seizures, sepsis, and trauma.

Methods

This paper describes and assesses current international and national CPGs relevant to prehospital care using an existing guideline database to strengthen resources for guideline development teams. We conducted a descriptive study of a database of global and local CPGs relevant to emergency care produced by the AFEM CPG project. We aimed to describe guideline characteristics such as scope, locale, methods, target audience, and guideline quality.

The database was produced during the AFEM CPG development project in 2016 as part of a rapid scoping review of local and international prehospital CPGs [11]. The database contains i) a Google Drive repository of the included guidelines and ii) a database of information on included guideline characteristics, country development location, developer type, methods, guideline topics and subtopics, and guideline quality scores using the AGREE II tool [13].

In order to identify CPGs, we did an initial guideline search conducted in October 2015 and identified 276 eligible CPGs (Appendix 1). Guideline topics and searching priority areas were defined through consensus and consultation with the AFEM clinical advisory and methods boards. Initially, there were eleven focus areas, but this was subsequently reduced to eight focus areas with sub-categories to decrease guideline scope. These focus areas were acute pain, airway management, altered mental status, dangerous fever, respiratory distress, resuscitation and ventilation, trauma, and shock/dehydration.

Quality appraisal of CPGs was performed in duplicate and independently by members of the AFEM CPG panel (Appendix 2). Domain scores were calculated as per the AGREE II methods.

The original database contained information such as guideline quality, guideline topics, country development location and year published.

All the CPGs in the AFEM database were included in this descriptive study. As well as guideline quality, year produced and guideline topic, we extracted data on i) overall guideline quality (measured using the AGREE II tool), ii) country classification (as correspondence or first author address, if not explicitly stated), iii) country income classification (as defined by the World Bank Classification [14]), iv) guideline producers, v) target audience, vi) sub-population (stratified by age), and other guideline characteristics such as year published, broad therapeutic disease area, guideline development method, and evidence grading classification. We extracted data directly from the guidelines to an Excel spreadsheet and imported it into STATA 14 (StataCorp) for analysis.

Spatial mapping was presented graphically to summarise the number of guidelines and guideline quality by country in R [15]. Continuous data (AGREE II scores) was assessed for normality, determined using quantitative (hypothesis testing) and qualitative (graphical) methods. Tabulation and graphical presentation were the primary methods of analysis. Appropriate parametric and non-parametric tests were used to test hypotheses at a $p = 0.05$ threshold for statistical significance. This study was approved by the Stellenbosch University Health Research Ethics Committee (S17/03/069).

Due to the AFEM guideline project's dependence on recommendations from high-quality CPGs as primary sources of evidence, the panel excluded guidance documents that did not strictly adhere to the Institute of Medicine definition of a clinical practice guideline [16]. Guidance documents such as protocols, care pathways and algorithms where there was no reference to a systematic processes of evidence synthesis and no clear link between evidence and recommendations were excluded, as the validity of recommendations could not be determined. Disagreements were resolved by panel discussion and consensus.

Results

In total, we included 276 guidelines in the analysis. Approximately

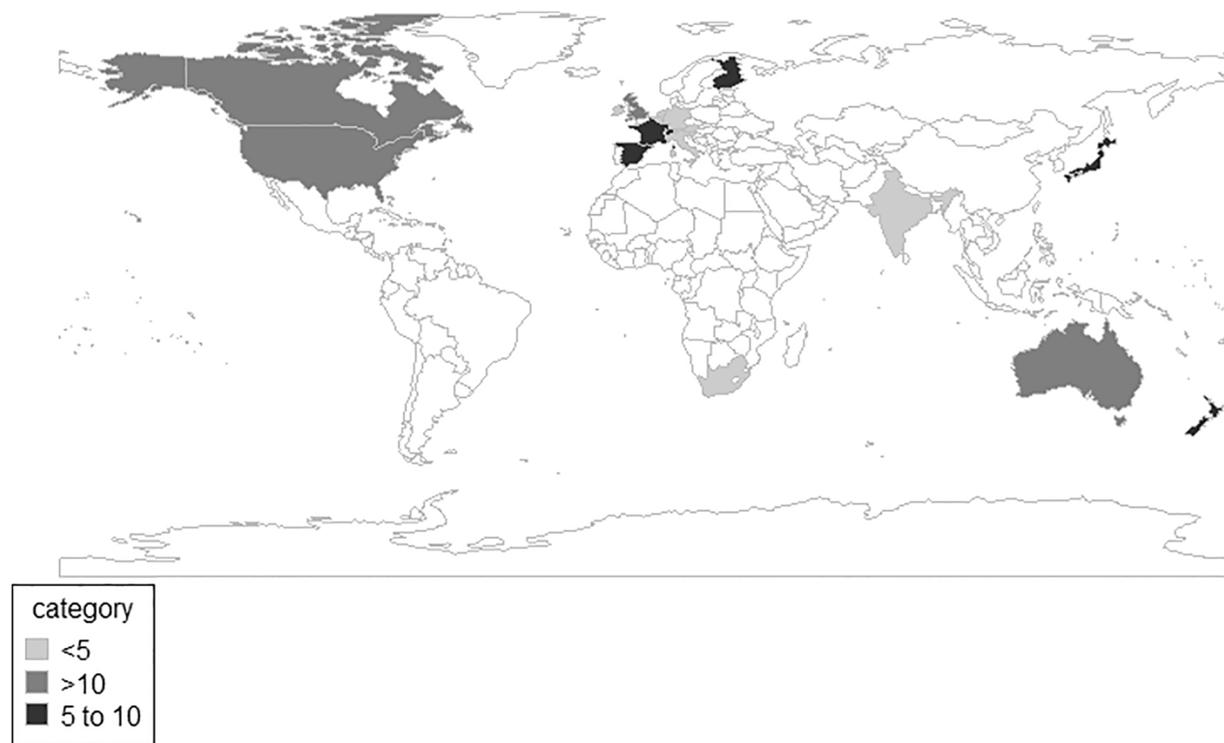


Fig. 1. Number of prehospital clinical practice guidelines by country.

half of the guidelines were published from 2010 onwards. *De novo* development methods were used in 58% (n = 150) of guidelines, a combination of *de novo* and/or adaptive methods were used in 8% (n = 19), use of expert reviews and literature reviews were reported in 4% (n = 8), with 32% (n = 82) of guidelines not specifying their development methods.

Nearly two-thirds of the guidelines were developed by professional societies or associations (63%, n = 164), with only a small proportion having been developed by international bodies or organisations (3%, n = 7). Only two guidelines originated from LMICs; the rest were from high-income countries (HICs) and none of these were specific to pre-hospital care (Fig. 1). The minority of guidelines (15%, n = 38) were prehospital-specific: 20% (n = 53) were in-hospital specific, and a large proportion (41%, n = 105) were mixed (both in-hospital and pre-hospital). Almost a quarter of guidelines (24%, n = 63) did not specify their target audience.

Considering age, the largest proportion of guidelines were applicable to adults (39%, n = 101), followed by infants (11%, n = 28) and pregnancy and childbirth (9%, n = 23). More than a quarter of guidelines focused on multiple population subgroups (28.5%). Table 1 provides a brief overview of the demographic population groups by guideline applicability. There were no prehospital-specific guidelines dedicated to neonates, infants or geriatric subpopulations. The majority of prehospital guidelines were produced by professional societies/

associations (63%, n = 164) for adults or mixed populations subgroups (cumulatively, ± 90%).

Across the 276 guidelines included, guidance was provided for 94 unique topics. The majority of topics focused on treatment (66.8%, n = 173), while 30% (n = 80) were mixed topics, including other clinical efforts such as disease prevention, screening and diagnosis. Dominant topics included resuscitation (15.5%, n = 40), stroke (6.2%, n = 16), poisoning and acute coronary syndromes (5% each, n = 13), general trauma and heart failure (2.7% each, n = 7), and asthma and ST-elevation myocardial infarction (2.3% each, n = 6). Various topics, such as psychiatric acute care, triage and communicable diseases (e.g. acute diarrhoea and acute bronchitis), contributed less than 1% of the total CPGs.

Table 2 provides an overview of development methods by guideline producers. Across guideline producers, the primary method of emergency care guideline development was *de novo*. National Departments of Health (NDoH) and professional societies predominantly used adaptive, or a combination of adaptive and *de novo*, methods. Professional societies/association guideline producers did not clearly specify their development methods in close to half of their guidelines. About one in nine (10.8%) guidelines used expert opinion or literature reviews as their primary development methods.

Overall guideline quality is presented in Table 3. Guideline quality was assessed with AGREE II, an international tool to assess the quality

Table 1
Subpopulation by applicability.

Applicability	Prehospital n (%)	In-hospital n (%)	Mixed n (%)	Unspecified n (%)	Total n (%)
Pregnancy and childbirth	2 (5.2)	14 (26.4)	7 (6.6)	0 (0)	23 (8.8)
Neonates	0 (0)	2 (3.7)	4 (3.8)	3 (4.7)	9 (3.4)
Infants	0 (0)	0 (0)	3 (2.8)	25 (39.6)	28 (10.8)
Children	1 (2.6)	6 (11.3)	5 (4.7)	4 (6.3)	16 (6.1)
Adults	18 (47.3)	18 (33.9)	42 (40)	23 (36.5)	101 (39)
Geriatrics	0 (0)	1 (1.8)	1 (0.9)	0 (0)	2 (0.7)
Mixed	16 (42.1)	10 (18.8)	42 (40)	6 (9.5)	74 (28.5)
All ages	1 (2.6)	2 (3.7)	1 (0.9)	2 (3.1)	6 (2.3)

Table 2
Methods by guideline producers.

Applicability	Professional Society/Association Guidelines n (%)	International Collaboration Guidelines n (%)	NDoH n (%)	Clinician/Academic Guidelines n (%)	Total n (%)
<i>De novo</i>	77 (46.9)	6 (85.7)	37 (78.7)	30 (73.1)	150 (58)
Adaptive	1 (0.6)	0 (0)	0 (0)	0 (0)	1 (0.34)
Expert opinion/literature review	3 (1.8)	0 (0)	0 (0)	5 (12.2)	8 (3)
<i>De novo</i> + adaptive	8 (4.8)	0 (0)	6 (12.7)	3 (7.3)	18 (7)
Unspecified	75 (45.7)	1 (14.2)	4 (8.5)	3 (7.3)	82 (31)

NDoH, National Departments of Health.

Table 3
AGREE II domains by guideline producers.

Domains	Professional Society/Associations Guidelines % (sd)	International Collaboration Guidelines % (sd)	National Guidelines % (sd)	Clinician/Academic Guidelines % (sd)	Overall Domain Scores	
					Median	Range
SP	67 (19)	80 (20)	84 (13)	68 (24)	72	24
SI	36 (22)	53 (7)	65 (21)	46 (19)	47	51
RD	61 (23)	69 (19)	72 (28)	58 (21)	61	29
CP	77 (21)	77 (16)	85 (15)	72 (19)	85	16
APL	36 (20)	54 (15)	60 (20)	37 (25)	38	38
EI	42 (17)	60 (19)	58 (23)	56 (31)	46	19
Overall, mean (sd)	4.32 (1.54)	4.57 (1.69)	5.10 (1.49)	3.81 (1.4)	4	3

AGREE, Appraisal of Guideline Research and Evaluation; SP, scope and purpose; SI, stakeholder involvement; CP, clarity of presentation; RD, rigour of development; APL, applicability; EI, editorial independence; overall judgement (score out of 7, 1 = lowest possible quality and 7 = highest possible quality); sd, standard deviation.

and reporting of practice guidelines. The maximum score for each AGREE domain is 100%, whereas the overall score is out of seven. Domains 1 and 4 (scope and purpose, clarity of presentation) both scored high, with 70% and 78%, respectively. Domains 2, 5 and 6 (stakeholder involvement, applicability, and editorial independence) each scored below 50%, while rigour of development scored 62%. Stratified by guideline producers, overall guideline quality and quality across domains varies widely. On average, guideline quality is significantly higher in those produced by national bodies (such as NICE or SIGN), compared to international guidelines (e.g. WHO), professional societies, and clinician or academic-produced guidelines ($p = 0.001$). Across CPG producers, median guideline quality was poorest in relation to applicability, editorial independence, and reporting stakeholder involvement, while clarity of presentation and scope of purpose showed high-quality reporting. Clarity of presentation had a median score of 85%, making it the highest scoring domain, followed by scope and purpose (72%). Overall, only 6.5% (95% confidence interval: 4–10%, $n = 18$) of included CPGs were recent (published from 2015 and onwards) and rated as moderate to high-quality (AGREE II score of > 4), all of which were developed *de novo* and originating from HICs for established prehospital settings.

Discussion

Less than 2% of the 276 emergency care guidelines that we identified originated from LMICs and no guidelines were specifically developed for prehospital care in low-resource settings. This highlights the need for investment in building local guideline development infrastructure and training, specifically in settings where guidelines from HICs cannot be readily adopted due to contextual differences. Furthermore, our results indicate that a very large proportion of emergency care guidelines were developed *de novo* (new), which might be expected considering that most guidelines originated from well-funded HICs where there may be sufficient resources to do this. However, these guideline developers still had a large sample of *de novo* guidelines from HICs that they could draw from to either adopt, adapt or contextualise to their local setting, instead of re-inventing the wheel

by doing *de novo* development. If one assumes that guideline developers would only want to use adaptive guideline techniques on up-to-date, high-quality guidelines, our results indicate that perhaps 10% of pre-hospital relevant guidelines could be translated to a local context using such methods. This 10% includes guidelines on resuscitation, acute coronary syndromes, heart failure, and trauma topics, originating mostly from European and American organisations, the Australian Queensland guidelines, and NICE. However, the relative lack of examples of adaptive guideline development methods, such as adoption [5] or adapting, adopting or contextualising existing high-quality guidelines [12,17] warrants attention. This is particularly important in resource-strapped settings where *de novo* development is not always affordable.

Guideline development training over the past decade has mostly focused on *de novo* guideline development, via universities (as component courses of professional degrees), professional groups (short courses), or as published information by groups dedicated to CPG development, such as the Guidelines International Network (G-I-N) [18]. Since *de novo* CPG development is time-consuming and expensive, there is an increased need for new emerging CPG-development approaches that do not rely on *de novo* development but use existing high-quality CPGs instead. This would be especially attractive for resource-constrained settings. In Africa, the South African Guidelines Excellence (SAGE) [19] project has started addressing these gaps by building capacity via CPG courses that focus on both *de novo* and adaptive guideline development methods [18] and providing open-access CPG-development toolkits [20].

Our findings highlight the need to strengthen prehospital guideline development quality worldwide, especially by professional societies and clinicians, because guideline quality was found to be significantly lower in these groups. Our findings reflect similar trends in studies assessing guideline quality, both in South Africa [7,21] and internationally, [22] where guideline quality varied by producers. Almost a third of guidelines did not specify a guideline development method, a key requirement when determining validity of evidence; this was reflected in their relatively poor ‘rigour of development’ domain scores in AGREE II results. Adherence to guideline development standards (such

as the G-I-N 11 standards [23] or the McMaster group's 18 standards [24]) will assist developers in addressing key issues of quality and improve guideline validity. Regrettably, these standards are biased towards *de novo* development and only a few pragmatic examples exist showcasing adaptive [3] or *de novo* [25] techniques in low-resource settings. Even fewer exist for prehospital care, as there are no standards.

Linked to guideline quality and reporting, we found more than 15 unique systems for rating evidence quality, similar to findings by Movsisyan (2018), who identified 17 unique ratings of evidence quality in guidelines for the effectiveness of health and social interventions [26]. Our analysis includes guidelines older than 2010, before dominant recommendations classifications were developed (such as GRADE) [26]. This, together with varied guideline development methods, might explain the heterogeneity we observed.

Although we did not perform an evidence gap assessment, there were important clinical topics for which we could not find appropriate prehospital guidance. These include intensive care transfers, crisis interventions and behavioural emergencies, psychiatric and aggressive patient emergencies, extremity trauma (including dislocations and amputation), abdominal and pelvic trauma, and gender-based violence and sexual assault. The geriatric subpopulation received the least attention in prehospital guidelines, which is surprising considering that most of the guidelines originated from HICs, where a growing elderly population is placing increasing pressure on healthcare systems.

In considering our findings on the status of emergency care clinical practice guidance available worldwide in early 2016, some limitations should be borne in mind as the quality of the data and selection of guidelines was dependent in large part on the methods, processes and demands of the immediate AFEM CPG project. The definition of a CPG was narrow and, therefore other documents which provide guidance in prehospital care globally (such as treatment protocols and care pathways) were excluded. It is also likely that some eligible guideline documents were missed in the searches, such as those reported in the grey literature or published in languages other than English. Future research should focus on bringing these guidelines into this landscape analysis and separately strengthening guideline development capacity in resource-poor settings.

Conclusion

Although some high-quality CPGs exist for emergency care, none are specific to prehospital care in LMICs, including in the African context. The majority of CPGs for emergency care are developed *de novo*, are from HICs, and vary in quality. Adaptive guideline development methods are seen in only a minority of prehospital guidelines, despite the potential time and cost-effectiveness of these methods. Our research shows that guideline developers in low-resource settings that cannot afford *de novo* guideline development have access to an expanding pool of high-quality prehospital guidelines to adapt to their local setting, but there are also some important topics for which robust evidence-based prehospital guidance is lacking. Future research should address these gaps by conducting relevant systematic reviews to inform *de novo* guideline development. We highlight the importance for strengthening adaptive guideline development methods that use existing high-quality CPGs. Further research, such as guideline case studies, is required to showcase the pragmatic application of adaptive guideline development methods to strengthen guideline development in resource-strapped settings for prehospital care.

Acknowledgements

The authors would like to acknowledge the African Federation for Emergency Medicine guideline panel for their invaluable contribution to the guideline database and critical appraisal.

Conflicts of interest

The publication originates from work commissioned and funded by the HPCSA Professional Board of Emergency Care. The funder commissioned the work, and approved the design and scope of the guidelines developed by the AFEM, but did not participate in the development of the methods in relation to this publication. MM, SB and LW are editors of this journal. They were in no way involved with the peer review process or editorial decision of this paper.

Dissemination of results

Results of this study will be shared at local and international conferences. Results will also be distributed via local newsletters, blogs, and social media, including targeted dissemination strategies for appropriate audiences.

Authors' contributions

MM conceptualised the research idea, collected data, performed the analysis and wrote the first draft of the manuscript. TY, SB and MC provided oversight and supervision of the research. MM, BdW, PH and JP were involved with guideline searching and appraisal. All authors read and approved the final manuscript. All authors agree with the manuscript results and conclusions.

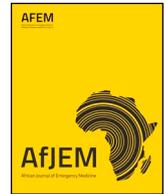
Appendix. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.afjem.2018.09.002>.

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Review article

Guidance we can trust? The status and quality of prehospital clinical guidance in sub-Saharan Africa: A scoping review

Petrus Malherbe^{a,*}, Pierre Smit^b, Kartik Sharma^c, Michael McCaul^d

^a Faculty of Medicine and Health Sciences, Stellenbosch University, South Africa

^b Hamad Medical Corporation, Doha, Qatar

^c McMaster Health Forum, McMaster University, Canada

^d Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, South Africa

ARTICLE INFO

Keywords:

Emergency care
Prehospital
Guideline development
Scoping review
Guideline quality

ABSTRACT

Introduction: Prehospital care is integral in addressing sub-Saharan Africa's (SSA) high injury and illness burden. Consequently, robust, high-quality prehospital guidance documents are needed to inform care. These guidance documents include, but are not limited to, clinical practice guidelines (CPGs), protocols and algorithms that are contextually appropriate for SSA. However, SSA prehospital guidance mostly originates from the 'Global North,' with limited guidance for Africa by Africans. To strengthen prehospital clinical practice in SSA, we described and appraised all prehospital SSA guidance documents informing clinical decision making.

Methods: We conducted a scoping review of prehospital-relevant guidance documents, including CPGs, algorithms, protocols and position statements originating from SSA. We performed a comprehensive literature search in various databases (PUBMED and SCOPUS), guideline clearing houses (Scottish Intercollegiate Guidelines Network, Trip, and Guidelines International Network), journals, various forms of grey literature and contacted experts. Guidance document screening and data extraction was done independently, in duplicate and reviewed by a third author. Guidance quality was then determined using the AGREE II tool and data were analysed using simple descriptive statistics.

Results: We included 51 guidance documents from 13 countries across SSA after screening 2320 potential documents. The majority of guidance documents lacked an evidence foundation, made recommendations based on expert input, and were predominantly end-user presentations such as algorithms or protocols. Overall, reporting quality was poor, specifically for critical domains such as rigour of development; however, clarity of presentation was generally strong. Guidance topics were focused around resuscitation and common diseases (both communicable and non-communicable) with major gaps identified across a variety of topics; such as mental health for example.

Conclusion: The majority of prehospital clinical guidance from SSA provides clinicians with excellent ready to use end-user material. Conversely, most of the guidance documents lack an appropriate evidence foundation and fail to transparently report the guidance development process, highlighting the need to strengthen and build guideline development capacity to promote the transition from eminence-based to evidence-based guidance for prehospital care in SSA. Guideline developers, professional societies and publishers need to be aware of international and local guidance document development and reporting standards in order to produce guidance we can trust.

African relevance

- Local, evidence-based, prehospital guidance is essential in addressing sub-Saharan Africa's high injury and illness burden
- We conducted a scoping review to describe and appraise all pre-hospital-relevant guidance documents in sub-Saharan Africa

- We present key gaps and highlight the need to strengthen methodology in sub-Saharan African prehospital guidance development
- Guideline developers, societies and publishers must be aware of development standards to produce trustworthy guidance

* Corresponding author.

E-mail address: malherbejp@gmail.com (P. Malherbe).

<https://doi.org/10.1016/j.afjem.2020.08.005>

Received 3 May 2020; Received in revised form 13 August 2020; Accepted 17 August 2020

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Introduction

As a region of mostly low- and middle-income countries (LMICs), sub-Saharan Africa (SSA) experiences a high volume of injury and illness requiring a robust system of emergency medical services [1]. Emergency medical services, and the prehospital care delivered, provide access to timely interventions and transportation of those in need. This plays an important role in reducing mortality and morbidity in the region. Emergency medical services in SSA are growing as more regions across SSA establish basic services by building and expanding formal prehospital service delivery infrastructure. This is often supported by organisations such as the African Federation of Emergency Medicine (AFEM). Additionally, various countries such as Rwanda and Zambia are establishing training programmes for emergency medicine specialists [2].

Emergency medicine as a whole can be found in both the in-hospital and pre-hospital environments, often with overlap of intended treatment goals and outcomes. However, irrespective of a country's level of prehospital services (whether it be first aid responders in a volunteer capacity, or formal emergency medical services staffed by health care professionals), prehospital care should be guided by the best available evidence. As the best available evidence could potentially be aimed at the early management goals of the emergency centre in-hospital, these goals and recommendations can sometimes be extrapolated to the pre-hospital environment. Local contexts and, ideally, patients' preferences should also be considered. These form the components of Evidence-Based Healthcare (EBH), where guidance and recommendations for healthcare decisions or interventions are based on the best- available evidence [3].

In the past two decades, despite Africa's high disease burden and health system challenges, progress has been made in accepting, adopting and implementing EBH principles [4]. An example of this is the clear recommendations about stopping bolus fluids in shocked children produced by the Paediatric Association of Kenya – recommendations that the World Health Organisation (WHO) is still to adopt [5]. Indeed, high-quality guidelines play an essential role in bridging the gap between current best available evidence and clinical practice. Concerns have been raised regarding the quality and availability of emergency care or prehospital clinical practice guidelines (CPGs) [6,7]. High-quality guidelines are especially important in LMICs as policymakers and healthcare providers can ill afford to make healthcare decisions based on outdated evidence, considering that it may lead to wasteful or less-efficient expenditure of finite resources. Resource limitations are quite well- known in LMICs and across SSA. A question that is raised, however, is whether implementing EBH increases cost-effectiveness in emergency medicine, or whether the opposite is true. This association is not yet clearly understood.

Several tools exist to aid in the critical appraisal of various study types. These tools are designed to standardise and improve the efficiency of the appraisal process and can either be qualitative or quantitative in nature. An example of such a tool is the Appraisal of Guidelines for Research and Evaluation II (AGREE II) tool which serves to assess the quality and variability of CPGs across various domains, including methodological rigour [8,9].

In a 2018 landscape analysis of 276 global emergency care Clinical Practice Guidelines (CPGs), less than 2% of CPGs originated from LMICs [7]. Furthermore, the authors concluded that 'although some high-quality CPGs exist relevant to emergency care, none directly address the needs of prehospital care in LMICs, especially in Africa' (p 158). This paints a concerning picture of the current status of African prehospital guidance and evidence informing downstream practice. However, the landscape analysis by McCaul et al. [7] excluded any other form of guidance documents such as algorithms, patient care pathways or clinical care protocols, potentially missing prehospital guidance documents that do not conform to the strict definition of a CPG, as set by the Institute of Medicine [10]. Guideline quality in prehospital care was

also raised as a concern, a sentiment prevalent across various disciplines, from primary health care to allied health [4,6,11]. Furthermore, a similar landscape analysis conducted of only South African guidance documents highlighted the lack of emergency care guidance available [12]. Guidance document quality seems to be a concern for LMICs, possibly due to their lack of formal guidance document organisations, technical capacity, or collaborations to develop evidence-based guidance documents [13,14]. This potential lack of available up-to-date high-quality prehospital guidance is not just a major concern for clinicians, but for guideline developers as well.

In prehospital care, the most common form of CPG development is *de novo*, whereby guidance documents are newly produced [7]. However, an alternative method is to adapt already published, high-quality evidence-informed CPGs to a particular setting [15,16]. These methods, often termed guideline adaptation, have been successfully showcased in various healthcare settings [17], including the African prehospital setting [18–20]. In general, they are considered more efficient than *de novo* development. However, guidance developers who use adaptation methods are dependent on up-to-date high-quality CPGs to adapt to their local settings. Without a clear picture of the availability and quality of local guidance documents, guidance developers may need to resort to *de novo* development. Failing that, they would need to spend more time and resources contextualising guidance from high-income countries, where the recommendations might not be transferable. Very little is known about the scope and quality of prehospital guidance in SSA. Therefore, this study has aimed to describe and appraise all pre-hospital-relevant guidance documents in sub-Saharan Africa.

Methods

Overarching method

This paper describes and appraises current Sub-Saharan African guidance documents to inform regional guidance developers and clinical decision making. A scoping review was chosen as the method of choice, as it allows the authors to map the spectrum of prehospital guidance documents available in SSA. It is also useful in describing scope, locale, methods, target audience and guidance quality (using AGREE II). In contrast to systematic reviews, which synthesise available evidence to answer a focused research question, scoping reviews attempt to map available literature, often utilising a broad study question to identify gaps in knowledge [21]. The study was reported according to the PRISMA extension for scoping reviews checklist [22]. The study protocol was approved by the Stellenbosch University Health Research Ethics Committee (U18/07/026).

Eligibility criteria

We included any prehospital-relevant guidance documents (considering the broadest definition, e.g. protocols, patient care pathways, standard operating procedures) published either in English or French since 2005, and published in countries within SSA as stipulated by the United Nations (UN) [23], listed in Appendix 1. We excluded healthcare infrastructure, administrative guidance and medical textbooks. The date of publication restriction was introduced to ensure that we captured the most up to-date guidance documents, likely used in current practice. Guidance documents related to COVID-19 were not considered.

Information sources

We conducted a comprehensive and broad search on 24 July 2019 (updated 25 June 2020) of databases (PubMed and Scopus), guideline clearing houses (Scottish Intercollegiate Guidelines Network, Trip, and Guidelines International Network), and Google Scholar. The search strategy was created with the assistance of an information technologist.

The search strategy for PubMed can be found in Appendix 2.1. We searched grey literature, such as hand-searching journals not indexed in PubMed/Scopus, prehospital society websites, local ministry of health websites for each country and hand-searched conference proceedings (also updated 25 June 2020). Additionally, we contacted experts, policymakers and clinicians for unpublished guidance documents (See Appendix 2.2 for list of all databases, journals and websites searched). We identified various experts working in SSA prehospital settings by way of societies and published works. They were contacted to seek counselling on guidance potentially missed during formal and grey literature searches. Experts merely suggested articles of interest to the authors that they may have potentially missed, and in no way influenced the development or results of this study.

Study selection

We merged the results of the searches using reference management software and removed duplicate records. Two authors (PM and PS) independently, and in duplicate, examined titles and abstracts to remove obviously irrelevant reports and retrieved full text of potential relevant documents. Full text was then screened for eligibility and prehospital relevance in duplicate and independently (PM and PS). In both title/abstract and full-text screening, any disagreements were resolved by consensus with a senior author (MM). We created a flow diagram to show the process of inclusion and exclusion of documents; potentially eligible studies that were excluded are noted in Fig. 1.

Data collection and items

Three authors (PM, PS and KS) independently extracted data from documents using a data extraction form, developed *a priori* by the authors. Data were collected for the following information: country, date of publication, guidance type, producer, target audience, subpopulation, health service area, health discipline, method of development, and evidence grading.

Guidance quality was assessed with AGREE II. The maximum score for each AGREE domain, of which there are six, is 100%. Landmark reference standards include the AGREE II tool [9], or the RIGHT extension (Reporting Items for practice Guidelines in Healthcare) for alternative guideline development methods [24]. At face value, both tools assess similar components of the guideline development process, which are considered indicators for quality. AGREE II was chosen as the preferred method of appraisal as two authors had better familiarity with it. In addition, it had a better quantitative representation of the appraisal scores for each included guidance document. It is worth noting that no reporting or quality checklist exists for end-user documents such as protocols or algorithms, even though these should be based on clear parent CPGs or systematic reviews. In light of this, AGREE II was used as a benchmark for all included study types, to improve comparability in appraisal impressions. Four authors (PM, PS, KS and MM) independently, and in duplicate, assessed the quality of included guidance documents using AGREE II. Any major discrepancies in scores were resolved by discussion amongst all four authors.

Data analysis

Data were extracted from the data collection forms to a Microsoft Excel spreadsheet (Microsoft Corporation) and imported into STATA 14 (StataCorp) for analysis. Spatial mapping was presented graphically to summarise the number of guidelines by country. Continuous data (AGREE II scores) were assessed for normality, determined using the Shapiro-Wilk test and reported appropriately using medians and interquartile ranges. Descriptive statistics was the primary method of analysis.

Results

Search results

The electronic search identified 2320 documents in total after removal of duplicates. 1935 documents were identified through databases, 218 documents identified through guideline clearing houses and 205 additional documents through grey literature sources. 171 potential full text articles remained after removing duplicates and obvious exclusions. 51 guidance documents were included in the scoping review, following the exclusion of 120 articles with reasons provided. In the updated searches, no new documents were found that could be included, and Fig. 1 was updated to reflect the latest information. Only two updates of previously included documents were found, but no changes were made to the original methods or process of development. Thus, their original AGREE II scores remained unaffected. The majority of included guidance documents were identified *via* grey literature, hand-searching journals and government websites. The search flow diagram can be seen in Fig. 1.

Characteristics and origin of guidance documents

13 SSA countries contributed 51 prehospital clinical guidance documents included in the scoping review. Approximately 41% (n = 21) of guidance documents were published from 2015 onwards. South Africa produced the largest portion of guidance documents at 61% (n = 31). Kenya produced 8% (n = 4) and Tanzania produced 6% (n = 3). See Fig. 2 for the guidance documents distribution across SSA. The largest proportion of guidance documents were algorithms (37%, n = 19), 29% (n = 15) were CPGs, clinical protocols represented 16% (n = 8) and review documents represented 14% (n = 7) of the total. Only 2 documents were position statements (4%).

More than half (57%, n = 29) of the guidance documents were produced by professional societies (e.g. AFEM or The South African Trauma Society), while national departments of health and clinicians/academics produced 22% (n = 11) and 20% (n = 10), respectively. International organisations contributed only one guidance document (2%). Guidance documents in SSA targeted a wide array of subpopulations. Subpopulations consisted of pregnancy and childbirth with 2% (n = 1), neonatal with 2% (n = 1), mixed paediatric with 10% (n = 5), and adults with 4% (n = 2). Furthermore, 'mixed populations' (applied to multiple, but not all subpopulations) comprised 24% (n = 12) of the total, 'all populations' (applied to all subpopulations) represented 28% (n = 14) and 'unspecified' subpopulations represented 31% (n = 16). While no explicit themes emerged within the subpopulations, topics were largely dictated by the document type. Disease-based guidance (malaria, heart failure, HIV, etc.) existed mostly in the form of STGs while symptom-based guidance (choking, tachycardia, stab wounds, etc.) existed mostly in the form of algorithms. Only 2 guidance documents addressed mental health issues (4% (n = 2)). While all guidance documents included were pertinent to prehospital care, only 22% (n = 11) were written primarily for prehospital providers. The majority of guidance documents (67% (n = 34)) in prehospital care in SSA were written for mixed primary target audiences (prehospital and in-hospital).

Guidance document quality

Ranked by their AGREE II domain scores, quality varied across producers, as presented in Table 1. On average, Domain 1 and 4 (scope and purpose, clarity of presentation) scored the highest, with 42% and 61%, respectively. Domains 2 and 6 (stakeholder involvement and editorial independence) scored 23% and 34%, respectively. The most important domain when considering scientific rigour, domain 3 (rigour of development), scored on average 13% across all guidance documents. When stratified by producers, clarity of presentation scored

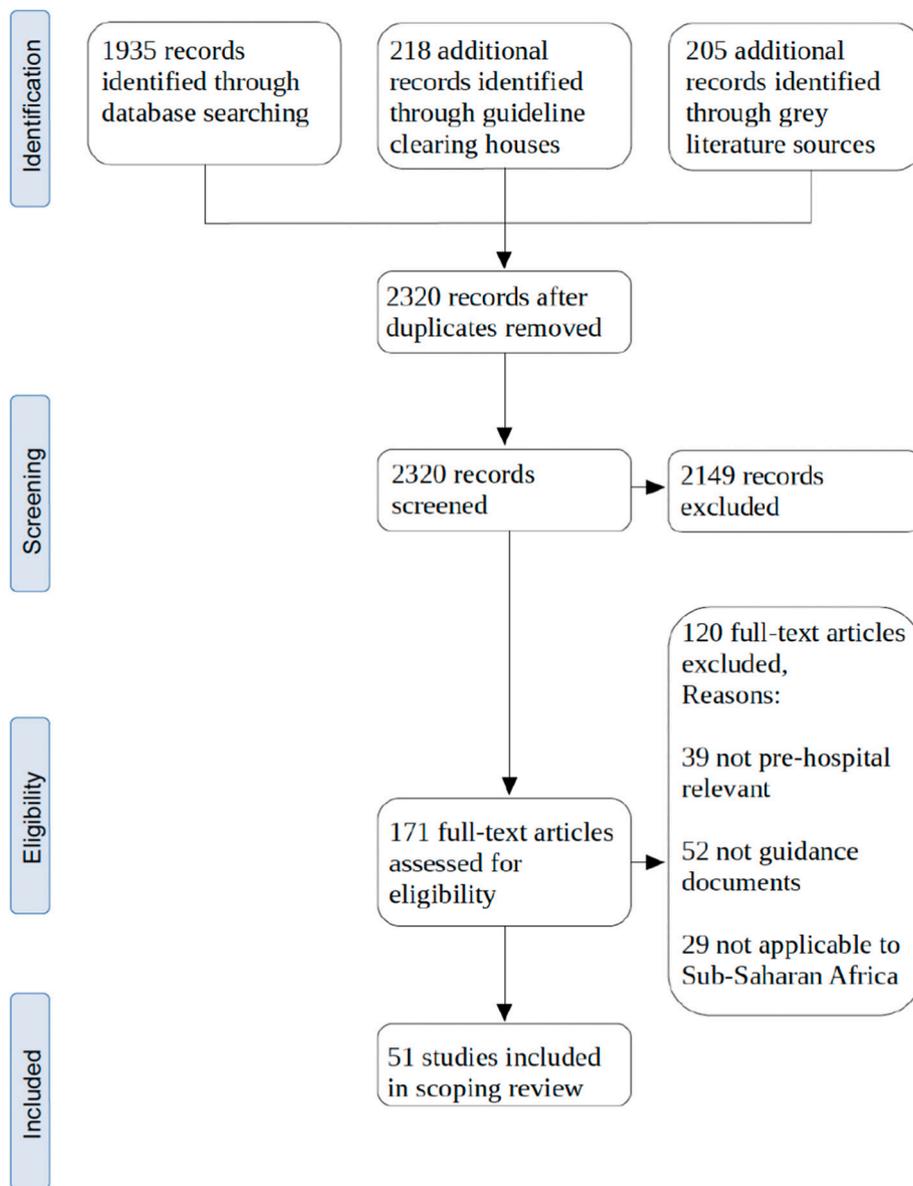


Fig. 1. Search flow diagram.

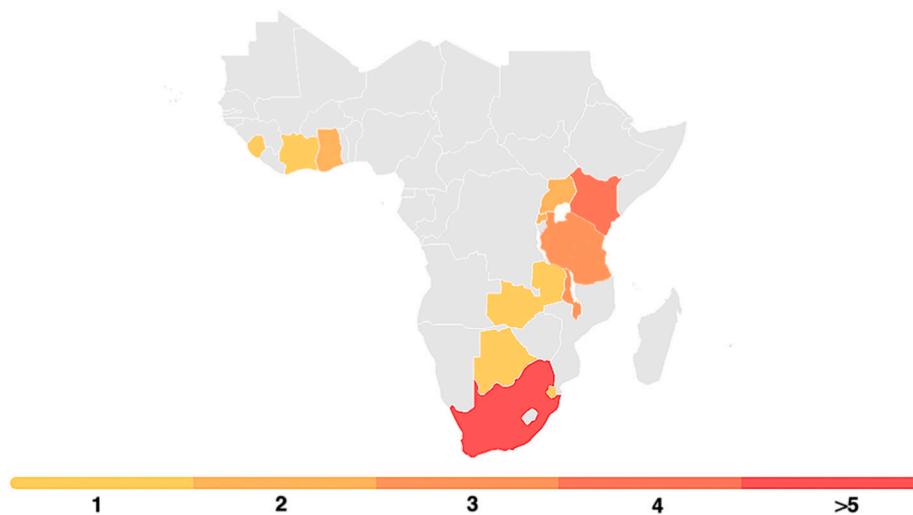


Fig. 2. Guidance document distribution by country.

Table 1
AGREE II domain scores by producer (out of 100).

Domains	Professional societies Median (Q1, Q3)	National departments of health Median (Q1, Q3)	Clinicians/ academics Median (Q1, Q3)	Domain scores Median (Q1, Q3)
SP	33 (26, 39)	54 (51, 63)	47 (35, 60)	39 (32, 53)
SI	8 (8, 15)	47 (38, 51)	19 (15, 24)	15 (8, 38)
RD	2 (2, 6)	21 (14, 26)	21 (13, 27)	10 (2, 22)
CP	65 (54, 71)	65 (62, 68)	56 (47, 65)	64 (53, 69)
APL	25 (24, 29)	47 (39, 53)	41 (23, 51)	29 (24, 44)
EI	10 (10, 10)	16 (12, 24)	30 (13, 42)	10 (10, 21)
Overall	29 (16, 33)	50 (41, 60)	37 (39, 45)	33 (25, 46)

AGREE, Appraisal of Guideline Research and Evaluation; SP, scope and purpose; SI, stakeholder involvement; CP, clarity of presentation; RD, rigour of development; APL, applicability; EI, editorial independence; overall judgement; sd, standard deviation.

high, whereas rigour of development scores showed a greater degree of variance. For example, professional societies scored poorly (9%) compared to national departments of health- (21%) and academic-produced guidance documents (20%). Refer to Fig. 3 for a representation of AGREE II scores by country.

As shown in Fig. 3, there is significant variance amongst AGREE II scores when stratified by country of origin. South Africa scored the lowest overall, even though articles such as the AFEM CPG (produced in South Africa) had the highest attributed average score (91.7%). This is due to the higher number of total studies produced, most of which were protocols and algorithms that generally had lower AGREE II scores on average. Several countries scored very high as they only had a single (or relatively few) articles published, generally of a higher quality.

No guidance documents included in our study were developed *de novo*, while only one guideline used clearly specified guideline adaptation methods. Additionally, 45% (n = 23) of guidance documents were based on a combination of unstructured literature reviews and expert opinion, while the majority (55%, n = 28) did not specify any methods of development at all. CPGs' overall AGREE II scores (and especially domain 3: rigour of development) were significantly higher

than other types of guidance documents. However, only two CPGs specified an evidence grading system for recommendations. Additionally, overall guideline quality differed significantly between guideline producers. Only 4% (N = 2) of guidance documents were recent (published from 2018 and onwards) and quality was rated as poor (AGREE II score of < 4 or < 50%).

Discussion

Our results reveal that the majority of guidance documents for prehospital providers in SSA, lack appropriate methodological reporting and transparency. This sheds doubt on the scientific validity and rigour of recommendations from these guidance documents. More than 55% (N = 28) of included guidance documents did not specify any methods of development. This is a concerning observation as the potential impact of life-saving care not being based on the best available evidence is unknown. Considering the overall poor rigour of development, especially from professional societies, there is a clear need for building awareness of guidance development principles. In addition, promoting the use of quality reporting tools such as AGREE II or the RIGHT statements [9,25], might improve the quality of guidance documents produced. Guidance development literacy, as a component of evidence-based decision making, is an essential competency for healthcare providers, decision makers and healthcare managers. Without this competency, it is likely prehospital guidance documents will continue to be developed through eminence-based as opposed to evidence-based methods [26] for the foreseeable future.

The majority of guidance documents available for prehospital providers in SSA are algorithms or protocols. These end-user-centric guidance documents usually provided little to no detail regarding their development process, nor what the underlying evidence-base was (*i.e.* the rigour of development). However, many are excellent examples of user-friendly and pragmatic clinical decision-making tools. Noteworthy examples include the Emergency Medicine Clinical Guidance for the Western Cape (South Africa), the Emergency Medicine Kenya Foundation Emergency Care Algorithms [27], and the Resuscitation Council of Southern Africa Algorithms [28].

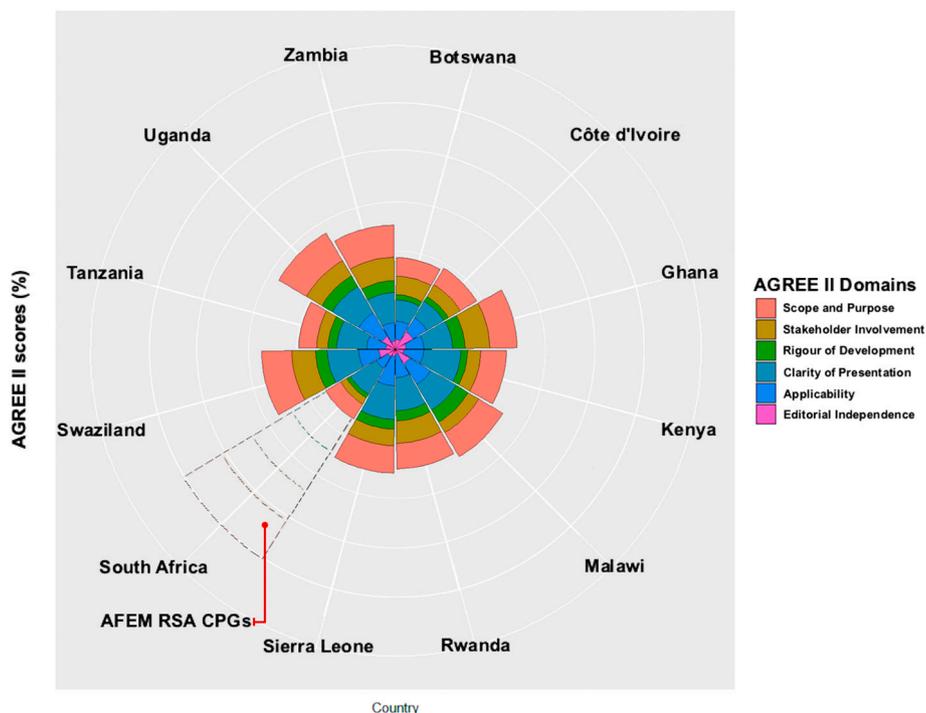


Fig. 3. AGREE II domain scores by country.

Given the significant resource constraints in LMICs, and especially SSA, it is understandable that some guideline developers do not have the means to develop guidance documents with excellent transparency on development. However, considering this, every possible effort to improve reporting on methods within these guidelines should be encouraged. Transparent reporting of guidance document development is essential, as without this users or policymakers have no means of judging whether recommendations provided are trustworthy or valid. Our results revealed unacceptably poor scores for editorial independence (such as reporting funding and conflicts of interest), stakeholder involvement and most importantly, rigour of development. All these elements are essential components of producing guidance documents we can trust.

Overarchingly, professional societies produced the least transparent, and therefore least trustworthy guidance documents. This reflects similar results seen at a global and regional level [7]. Developers of CPGs and end-user documents can learn from organisations such as the Belgian Red Cross's Centre for Evidence-Based Practice (CEBaP). They developed basic and advanced first aid manuals for first responders in Africa in an end-user document format. These manuals provided clear evidence for their *de novo* guidance development methods, without compromising on the usability of the clinical decision tool [29,30]. Our results indicate such transparency in reporting, and acknowledgment of the original evidence base or source guideline, is lacking in the vast majority of end-user documents produced in SSA.

A wide array of topics were represented within guidance documents, though major gaps were identified. Infectious diseases (especially Ebola, malaria and other endemic infectious diseases) were fairly well described amongst a number of included articles. Similarly, toxicology, trauma, cardiology, CPR, metabolic diseases and endocrinological diseases were well represented. Primary health care was especially well described in guidance documents self-labelled as "Standard Treatment Guidelines" (STG). These STG documents covered a wide array of responses and recommendations to healthcare burdens commonly associated with the region or country for which they were developed. The protocols and algorithms included were predominantly focused on streamlining the management of certain patient presentations in the emergency setting. They tended to focus on a single disease process or management strategy, whereas standard treatment guidelines resembled CPGs in method of development, and user-presentation.

While 24% of guidance documents were written for 'all populations', existing mostly in the form of national STGs, a disconcertingly low proportion of guidance documents were written with the primary focus on 'pregnancy and childbirth' or 'neonatal' populations. Furthermore, only two of the guidance documents identified mentioned mental health- or psychiatry-related events, both from Kenya. This is of concern due to the fact that 46% of countries in Africa have no formal mental health policies [31]. In addition, across the continent the number of disability-adjusted life years attributed to mental health, nearly equalled the number of disability-adjusted life years attributed to infectious diseases [31]. Increased awareness is required in order to improve implementation of health services for mental health; pre-hospital guidance documents are no exception. Mental health emergencies often require prehospital providers to serve as the first point of contact. It is therefore crucial that prehospital guidance pertaining to mental health in SSA be created.

De novo guidance development is considered time-consuming, expensive, and often out of reach for LMICs, especially in Africa. Of the CPGs produced in SSA, none used *de novo* methods. The majority used literature reviews, expert input or informal guideline adaptation methods, as opposed to formal adaptation methods such as adoption [32], ADAPT [33], or others [19,34-36]. Considering the international standards in guidance development and the continuous movement toward evidence-based decision-making [4], we argue that if any guidance in prehospital care is to be developed, the methods of development should be transparently and clearly reported [37]. This would be

recommended irrespective of whether guidance takes the form of formal CPGs, protocols, or algorithms.

Where methods and transparency are unclear, there is potential for various forms of bias to creep into the guidance development process. This undermines trust in guidance, and ultimately affects patient outcomes. As a consequence, when evidence is open to misinterpretation [38], recommendations are open to conflicts of interest [39] and undue influence, especially, in situations where decisions are being made by various stakeholders on how recommendations should be implemented [18,37]. Considering how important locally appropriate guidance is to clinicians in day to day practice, it is essential that African guidance developers are aware of international standards when developing and reporting clinical guidance. In light of this, African journals and societies are increasingly requiring authors to adhere to quality standards set out by the international community, in order to publish guidance documents [40].

Of the 51 documents we included, the largest portion of included documents came from grey literature sources. Overall, we found it quite challenging to find documents on SSA in general, and especially in grey literature sources. We presume it will likely be even more challenging for clinicians seeking best practice advice. Finding trustworthy guidance documents should not be a difficult process. Considering this, key priorities that require attention include the need to improve guidance document access, as well as increasing guidance document quality and transparency, by considering central coordination of guidance documents in SSA. The African Federation for Emergency Medicine is well placed to spearhead such an initiative in SSA, where a prehospital or emergency medicine guidance repository can be hosted. This repository would require adherence to international guidance standards (such as AGREE II) and improve access to guidance documents in SSA. Such an initiative will require a consolidated regional effort, of which the first step is adherence to international guidance document development and reporting standards by all stakeholders involved. Considering limitations, we made concerted efforts to comprehensively search for all available prehospital guidance in SSA. However, it is likely we have missed potentially important documents which were not available electronically, or open to the public.

Conclusion

The majority of prehospital clinical guidance from SSA provides clinicians with excellent end-user material. Conversely, most material lacks an appropriate evidence foundation and fails to transparently report the guideline or guidance development process. This highlights the need to strengthen and build guidance development capacity, to promote the transition from eminence-based to evidence-based guidance for prehospital care in SSA. Guidance document developers, professional societies and publishers need to be aware of international guideline development and reporting standards in order to produce guidance we can trust. To improve access to clinical guidance and end-user documents in SSA, and improve the development thereof, a guidance coordinating centre should be considered.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.afjem.2020.08.005>.

Dissemination of results

PM presented on the findings of this study at the Emergency Medicine Society of South Africa Conference in November 2019.

Authors' contributions

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: PM contributed 35%; PS and MM 25%; and KS 15%. All

authors approved the version to be published and agreed to be accountable for all aspects of the work.

CRediT authorship contribution statement

MM conceptualised the research idea and supported PM, PS and KS in writing the manuscript. MM and PS provided input and guidance regarding scope, searching, methods, data collection and analysis. PM, PS, and KS searched and collected data, supported by MM. PM, PS and KS all contributed to data collection, while all authors were involved with AGREE scoring. MM contributed as supervisor, and PS as co-supervisor. All authors contributed to writing the manuscript, approved the final version and met the International Committee of Medical Journal Editors (ICMJE) criteria for authorship. MM 20%, PS 30%, KS 15%, PM 35%.

Declaration of competing interest

PM was supported by the Stellenbosch University Undergraduate Conference Presentation Fund for conference attendance linked to this manuscript. KS was supported by the Queen Elizabeth Scholarship in Strengthening Health and Social Systems during the time of this study. MM was involved as a methodologist in the AFEM 2016 CPGs for the Health Professions Council of South Africa (HPCSA). MM was removed from any decision, data collection or AGREE scoring for those guidelines. MM is an editor of the African Journal of Emergency Medicine. MM was not involved in the editorial workflow for this manuscript. The African Journal of Emergency Medicine applies a double blinded process for all manuscript peer reviews. The authors declared no further conflict of interest.

Acknowledgements

The authors would like to acknowledge Anel Schoonees (Centre for Evidence-based Health Care, Stellenbosch University) for her support in developing the search strategies, including support from Stellenbosch University Faculty of Medicine and Health Sciences Library. Furthermore, the authors would like to thank the regional guideline experts who provided support for finding grey literature.

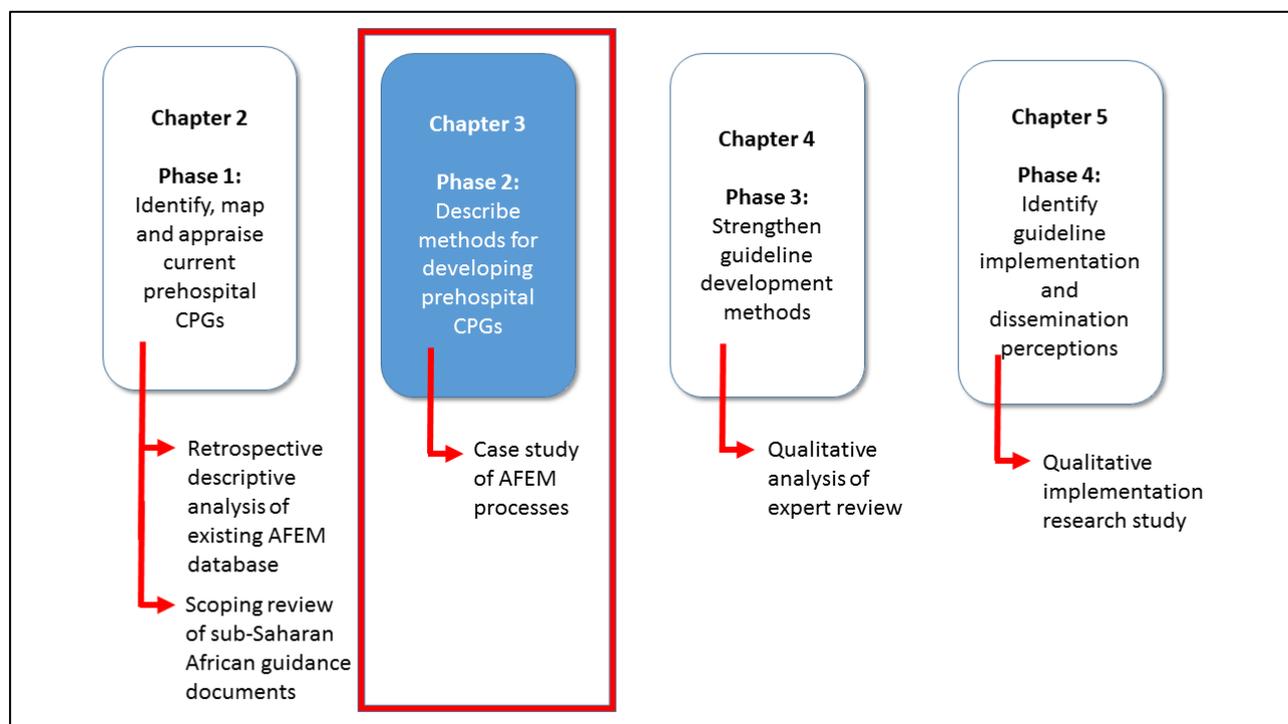
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Chapter 3: Describe methods for developing prehospital clinical practice guidelines

Qualitative case study of the AFEM Clinical Practice Guideline Project



Summary, publications and linked presentations

In this chapter I describe the AFEM CPG project conducted in 2016 for prehospital providers in South Africa, through a critical reflection and as a case study. This chapter includes two linked publications: i) a critical reflection of the AFEM guideline methods; and ii) a qualitative case study of the AFEM guideline development methods and implementation.

I aimed to describe and strengthen the methods of developing prehospital CPGs using alternative guideline development methods through a case study design. Key informants were purposefully sampled in order to maximise the diversity of data relevant to the study aims. I invited participants from the guideline funders ($n = 1$), core guideline panel ($n = 4$) and the guideline advisory board ($n = 6$) via email or telephone. Data were collected from one focus group and six in-depth interviews, providing a total sample of 10 participants. Transcribed data were analysed thematically through manual coding. Overarching themes and sub-themes were inductively developed and categorised as challenges and recommendations and further transformed into action points. Unfortunately, the guideline funders were unable to contribute.

Key challenges revolved around guideline implementation as opposed to development. These included the unavoidable effect of interest and beliefs on implementing recommendations, the national evidence void, a shifting implementation context and opposing end-user needs. Guideline development and implementation-strengthening priority actions included: i) developing a national end-user document; ii) aligning recommendations with national practice; iii) communicating a clear and consistent message; iv) addressing controversial recommendations; v) managing the impact of interests, beliefs and intellectual conflicts; and vi) transparently reporting implementation decisions.

In conclusion, the cornerstone of a successful guideline development process is the translation and implementation of CPG recommendations into clinical practice. I highlighted key priority actions for

prehospital guideline development teams with limited resources to strengthen guideline development, dissemination and implementation by drawing from lessons learnt from a prehospital guideline project conducted in South Africa.

PUBLICATIONS

1. **McCaul M**, de Waal B, Hodkinson P, Pigoga JL, Young T, Wallis LA. Developing prehospital clinical practice guidelines for resource limited settings: why re-invent the wheel? *BMC Res Notes*. 2018;11(1):97. doi:10.1186/s13104-018-3210-3. <https://bmcrenotes.biomedcentral.com/articles/10.1186/s13104-018-3210-3>.

BMC Research Notes (<https://bmcrenotes.biomedcentral.com/>), Impact Factor: 1.34, h-index: 59. Open Access.

Author contributions: MM wrote the first draft of the manuscript. All authors (MM, BW, PH, JLP, TY, LW) contributed to the writing of the manuscript and were involved in the AFEM CPG development project. ICMJE criteria for authorship read and met by all authors.

2. **McCaul M**, Young T, Bruijns S, Clarke M. Strengthening prehospital clinical practice guideline implementation in South Africa: A qualitative case study. *BMC Health Serv Res* 20, 349 (2020). <https://doi.org/10.1186/s12913-020-05111-x>.

BMC Health Services Research (<https://bmchealthservres.biomedcentral.com/>), Impact Factor: 2.26, h-index: 90. Open Access.

Author contributions: MM conceptualised the research idea, collected data, performed the analysis and wrote the first draft of the manuscript. MC, TY and SB provided analytical support, oversight and supervision of the research. ICMJE criteria for authorship read and met by all authors.

LINKED PRESENTATIONS

McCaul M, de Waal B, Hodkinson P, Pigoga J, Young T, Wallis L. Developing clinical practice guidelines for low-to-middle income countries: methods, experiences and lessons learnt in adapting, adopting or contextualising existing CPGs. iCAHE Conference. 6-10 November 2017. Adelaide, Australia. (Oral presentation). **Award: Best Oral Presentation**

McCaul M, de Waal B, Hodkinson P, Pigoga J, Young T, Wallis L. Guidelines for prehospital emergency care: Why re-invent the wheel? Global Evidence Summit 2017. 13-16 September 2017, Cape Town, South Africa. (Poster presentation)

McCaul M, de Waal B, Hodkinson P, Pigoga J, Young T, Wallis L. Developing clinical practice guidelines for South African Emergency Care: A methodological overview. International Conference on Emergency Medicine. Egypt. April 2016. (Oral Presentation)

McCaul M, de Waal B, Hodkinson P. Clinical Practice Guideline Panel discussion. Emergency Care Society of South Africa Conference, 2016. Cape Town. (Panel Discussion)

APPENDICES

Appendix 3.1 Social media engagement

Appendix 3.2 Adaptive guideline development process

Appendix 3.3 Semi-structured interview schedule

RESEARCH NOTE

Open Access



Developing prehospital clinical practice guidelines for resource limited settings: why re-invent the wheel?

Michael McCaul^{1*} , Ben de Waal², Peter Hodgkinson³, Jennifer L. Pigoga³, Taryn Young^{1,4} and Lee A. Wallis^{3,5}

Abstract

Objectives: Methods on developing new (de novo) clinical practice guidelines (CPGs) have received substantial attention. However, the volume of literature is not matched by research into alternative methods of CPG development using existing CPG documents—a specific issue for guideline development groups in low- and middle-income countries. We report on how we developed a context specific prehospital CPG using an alternative guideline development method. Difficulties experienced and lessons learnt in applying existing global guidelines' recommendations to a national context are highlighted.

Results: The project produced the first emergency care CPG for prehospital providers in Africa. It included > 270 CPGs and produced over 1000 recommendations for prehospital emergency care. We encountered various difficulties, including (1) applicability issues: few pre-hospital CPGs applicable to Africa, (2) evidence synthesis: heterogeneous levels of evidence classifications and (3) guideline quality. Learning points included (1) focusing on key CPGs and evidence mapping, (2) searching other resources for CPGs, (3) broad representation on CPG advisory boards and (4) transparency and knowledge translation. Re-inventing the wheel to produce CPGs is not always feasible. We hope this paper will encourage further projects to use existing CPGs in developing guidance to improve patient care in resource-limited settings.

Keywords: Prehospital, Emergency medicine, Emergency care, Clinical practice guidelines, Guidelines, Guideline development, Adaptation

Introduction

Clinical practice guidelines (CPGs) form the cornerstone of providing synthesised systematic evidence-based guidance to patients, healthcare practitioners and managers. Methods on developing new (de novo) CPGs have, of late, received substantial attention [1]. However, the volume of literature is not matched by research into alternative methods of CPG development using existing clinical practice guidance documents [2], a specific issue for guideline development groups in low-and middle-income countries (LMICs). De novo CPG development could be out of reach for many, as it is a time-consuming

and expensive process requiring multifaceted teams of methodologists and experts who systematically review and synthesise primary evidence, to ultimately produce locally appropriate recommendations. Furthermore, some argue that the higher burden of disease in LMICs makes the focus on evidence-based guidelines even more urgent, to minimise wastage and ensure the best patient care for optimal cost [2, 3].

Consequently, alternative approaches to de novo CPG development have been proposed, using existing high-quality clinical guidelines to make recommendations relevant to local contexts through a process of adopting, adapting or contextualising [2, 4]. These approaches are attractive where resources are limited, especially when high-quality guidance already exists (mostly from high-income countries) [5, 6]. However, limited examples exist in the literature to showcase the pragmatic application

*Correspondence: mmccaul@sun.ac.za

¹ Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Stellenbosch University, Cape Town, South Africa
Full list of author information is available at the end of the article

of such alternative approaches in settings with time and budget constraints.

South African prehospital emergency care providers are currently practicing based on protocols that are more than a decade old [7]. These protocols focus mainly on resuscitation and pharmacopeia, providing little-to-no information on background evidence, contextual application or care of patients. The South African emergency care profession has seen rapid growth, but the profession faces a particular challenge with developing guidelines as there is a myriad of pre-hospital qualifications and an inequitable workforce distribution across the country. Consequently, there has been a recent drive to develop evidence-based CPGs to replace the existing protocols with reliable and robust guidelines. This is of particular value and importance for guideline development methods in Africa, especially since prehospital care protocols to-date still use GOBSAT methods (good-old-boys-sitting around-a-table) [7] with a lack of due processes and little reliance on evidence. Developing such evidence-based guidelines would be a major step forward in adopting better and more structured practices for the guideline development footprint in sub-Saharan Africa. In this paper, we report on how we developed context specific prehospital CPGs, along with the difficulties experienced and lessons learnt in applying existing global guidelines' recommendations to a national context.

Main text

About this project and process highlights

The primary focus of the project was to create a contextually appropriate evidence based CPG for prehospital emergency care providers and managers. The guideline needed to be patient-centred, realistic and enhance the continuation of care through the emergency system from prehospital to patient discharge. The detailed aims and scope of the project have been reported elsewhere [8].

Developing a comprehensive prehospital CPG is a daunting project that would take years to complete de novo. Due to limitations in time, funding and the sheer scope of the project, this was not an option. We thus adopted a novel approach allowing us to work within our resource constraints [2]. This alternative approach started via engagement with an advisory board of key stakeholders, including methodologists, prehospital providers and various medical specialists. After clarifying the clinical questions, the core guideline team (an independent working group supported by the advisory board) identified and appraised existing CPGs (as there exists internationally a wide range of high-quality international CPGs covering most of the key topics required) and then used these to develop contextually appropriate evidence-based CPGs.

Comprehensive searching for CPGs was performed and followed systematic review methods, including comprehensive searching of the literature (Additional file 1), critical appraisal and synthesis. Potential included guidelines where full text was obtained were critically appraised using the AGREE II tool [9]. The AGREE II scores were used to assess and prioritise which guidelines to include, particularly if there were two or more competing guidelines on similar topics. Within priority areas, different guideline recommendations often overlapped; in this case the most current and unambiguous recommendation was accepted. High-quality, relevant and up-to-date guidelines were prioritised through consensus by the core guideline panel. In some cases, guidelines were excluded due to extremely poor AGREE II scores, even when there was only a single guideline on the topic.

Dizon et al. describe the process of adopting, adapting or contextualising existing CPGs for local use and have set the foundation on which this CPG was formulated [2] (Additional file 2). We 'adapted' this method into a simpler method for formulating recommendations based on existing evidence. Any decision to adopt, adapt or contextualise was made by the core guideline panel and reviewed by the advisory board. Where applicable, 'practice points' were also added; these included more specific guidance to clinicians regarding how to perform a particular intervention, or provided further clarity for use at the bedside (e.g. how to prepare and administer a drug related to a particular recommendation).

Process	Explanation
Adopting	Recommendations were adopted when they could be applied directly, without any changes, to the South African context. Adopting meant a commitment to implement its recommendations as proposed, without any subtle changes or caveats
Adapting	Recommendations were adapted if they required changes, updated evidence (preferably from a systematic review) or adding implementation caveats that changed the meaning of the original recommendation. Adapted recommendations are considered new recommendations and no longer have an attached level of evidence or strength of recommendations
Contextualising	Contextualising a recommendation meant not making any changes, but incorporating local context conditions integral for implementing the recommendation [2]. Contextual points included commentary around locally-appropriate alternative methods of intervention delivery, system issues that would need to be addressed, or simply caveats to the recommendation within the current emergency care system

A brief example of adopting, adapting and contextualising guidelines is presented in Additional file 3. Additional tables and figures are available as on-line supplements to

this paper, and provide useful insights into processes for other countries and guideline teams.

Overall, the steps and processes are predominantly the same as for de novo guideline development. However, key differences included identifying and synthesising high-quality CPGs for emergency care, instead of primary level evidence such as randomised controlled trials or observational studies. The main differences between de novo development and this guideline approach is highlighted in Additional file 4 [1].

Our experience

The project produced the first emergency care CPG for prehospital providers in Africa. It included more than 270 CPGs and produced over 1000 recommendations for prehospital emergency care (Additional file 5). It represents a transition from opinion-based and skills-driven practice to evidence-informed clinical practice. The guideline is currently in the implementation and dissemination phase, with national health regulatory bodies in the process of incorporating public and industry feedback on the guidelines.

We encountered various difficulties in guideline development within emergency care. We have summarised the three key factors that generated debate and uncertainty throughout the process.

Applicability: few pre-hospital CPGs applicable to Africa

Fewer than 1% of the 276 included CPGs originated from and were directly applicable to LMICs, as the vast majority of the data came from the United States, Europe and Australia. We found no CPGs that provided targeted recommendations for prehospital emergency care in LMIC settings. This provided a particular challenge to the process of adopting, adapting or contextualising, as in most cases the generalisability and applicability of recommendations to the local setting was unclear.

Evidence synthesis: heterogeneous levels of evidence classifications

Reporting adopted or contextualised guideline recommendations' level of evidence and strength of recommendations was difficult. Different CPGs used different classification systems (e.g. GRADE or NHMRC) and as such, we found significant heterogeneity between recommendation reporting systems. This made reporting recommendations difficult, as each has a different and often indistinguishable classification system. In response to this, we opted to report the original plain language meaning for each classification. For example, level I evidence was simply reported as 'evidence obtained from a systematic review of all relevant randomised controlled trials', taken verbatim from the original classification

description. Guideline developers should use a single, robust and clear recommendations classification system, such as GRADE.

Guideline quality: all are not equal

The quality of included CPGs varied significantly, with many scoring so poorly on AGREE-II that they were excluded. We screened more than 1000 'guidelines', but the majority were excluded simply due to the absence of any reported methods or not using a systematic process of synthesising evidence. There was significant variation between guidelines developed by professional societies compared to collaborative groups. Guidelines from larger organisations, such as Guidelines International Network (G-I-N), National Institute for Health and Care Excellence (NICE) and the National Guidelines Clearinghouse (NGC) were often the highest quality.

Learning points

Focus on key CPGs and evidence mapping

Guidelines teams should focus on selecting only a couple of key high-quality, relevant, up-to-date CPGs for adoption or adaptation to save considerable time and effort when extracting relevant recommendations. This should only be done within the background of having clearly clarified the guideline scope and prioritisation of clinical questions. Despite doing this, guidelines teams could still end up with large numbers of guidelines that have relevant recommendations linked to multiple clinical questions. To mitigate this confusion, guideline teams should map and match clinical guidelines to the a priori defined clinical questions and focus areas. This could take the form of a database or an electronic mind map, which assist with cross-referencing, identifying evidence gaps, and grouping recommendations for the various guidelines within clinical questions and overarching topics.

Searching other resources for CPGs

PubMed, EMBASE and equivalent medical literature databases are traditionally the first port of call for finding evidence. However, we found that these traditional databases alone yielded very poor results. Out of the 276 CPGs included, only three originated from PubMed. The majority were identified in guideline clearing houses (e.g. NGC), databases (e.g. G-I-N or NICE), or Google. Guidelines teams should thus use alternative sources to traditional electronic databases when searching for CPGs.

Broad representation on CPG advisory board

To promote wide input and buy-in from key role players, it was important that representatives from a range of fields within and relating to emergency care were

involved [10]. These included training institutions, emergency physicians, and medical specialists involved in receiving and care of patients managed by emergency care providers. The advisory panel was involved at key points in the process. They reviewed each CPG relevant to their practice and their comments were incorporated into the final CPG to make it context-specific and ensure that it was in line with existing national guidelines and processes as best as possible.

Transparency and knowledge translation

Transparency in guideline development is of utmost importance, especially in complex processes and decision-making events such as incorporating advisory board input, adapting methods to respond to the political environment and engaging project sponsors. Keeping clear records of such events, decisions and processes is essential in producing a robust and trustworthy CPG. Regular feedback around processes and interim progress reports to sponsors provide mechanisms to ensure a complete product.

Although CPGs act as a vehicle for change and knowledge translation, focusing on clear dissemination and implementation strategies, including end-user content, is paramount to enabling successful uptake of guidelines. Regrettably, these elements were outside the scope of this project, as time and budget were limited; however, guideline teams should strongly consider incorporating guideline implementation and dissemination strategies as part of the initial conversation on scope and timeframe.

Looking to the future, this project seeks to further validate and strengthen alternative guideline development methods for resource-limited settings, and to conduct further research to support guideline implementers in formulating a national guideline implementation and dissemination strategy by investigating local barriers and solutions among paramedics to promote guideline uptake together with decision makers. Re-inventing the wheel to produce CPGs is not always feasible. We hope this paper will encourage further projects to use existing CPGs in developing guidance to improve patient care in resource-limited settings.

Limitations

The African Federation for Emergency Medicine (AFEM) project only included clinical practice guidelines to adapt, adopt or contextualise that were of high-quality, up-to-date and that fit the strict Institute of Medicine definition of clinical practice guidelines. Other guidance documents such as protocols, end-user guides or patient pathways were excluded.

Additional files

Additional file 1. Search strategy and example search string.

Additional file 2. Suitcase analogy for adopting, adapting and contextualising guidelines.

Additional file 3. Example recommendations: adopting, adapting and contextualising.

Additional file 4. De novo vs African Federation for Emergency Medicine (AFEM) alternative guideline development approach.

Additional file 5. Guideline inclusion flow diagram.

Abbreviations

AFEM: The African Federation for Emergency Medicine; CPG: Clinical Practice Guideline; EMS: Emergency Medical Services; GRADE: Grades of Recommendation Assessment, Development and Evaluation; G-I-N: Guidelines International Network; HPCSA: Health Professions Council of South Africa; LMIC: Low- and middle-income countries; NGC: National Guidelines Clearinghouse; NHMRC: National Health and Medical Research Council; NICE: National Institute for Health and Care Excellence; PBEC: Professional Board of Emergency Care; SAGE: South African Guidelines Excellence Project.

Authors' contributions

MM wrote the first draft of the manuscript. All authors (MM, BW, PH, JLP, TY, LAW) contributed to the writing of the manuscript and were involved in the AFEM CPG development project. International Committee of Medical Journal Editors (ICMJE) criteria for authorship read and met by all authors. All authors agree with manuscript results and conclusions. All authors read and approved the final manuscript.

Author details

¹ Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Stellenbosch University, Cape Town, South Africa. ² Department of Emergency Medical Sciences, Cape Peninsula University of Technology, Cape Town, South Africa. ³ Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa. ⁴ Cochrane South Africa, South African Medical Research Council, Cape Town, South Africa. ⁵ Division of Emergency Medicine, Stellenbosch University, Cape Town, South Africa.

Acknowledgements

We would like to acknowledge the South African Guidelines Excellence Project (SAGE) and Paul Garner, Liverpool School of Tropical Medicine, for methodological input.

Competing interests

The publication originates from work commissioned and funded by the HPCSA Professional Board of Emergency Care. The funder commissioned the work, and approved the design and scope of the guidelines, but did not participate in the development of the methods in relation to the publication in question.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Consent to publish

Consent has been obtained for all figures in this publication.

Ethics approval and consent to participate

No ethical approval was required for this project as this is secondary research.

Funding

AFEM was commissioned by the Health Professions Council of South Africa (HPCSA) to undertake the work on this guideline. The HPCSA Professional

Board of Emergency Care had no involvement or input with the internal work including advisory board or methods processes or formulation of recommendations. The methodologists (MM and TY) are partly supported by the Effective Health Care Research Consortium. This Consortium is funded by UK aid from the UK Government for the benefit of developing countries (Grant: 5242). The views expressed do not reflect UK government policy.

Publisher's Note

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

Received: 21 September 2017 Accepted: 31 January 2018

Published online: 05 February 2018

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RESEARCH ARTICLE

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Strengthening prehospital clinical practice guideline implementation in South Africa: a qualitative case study

Michael McCaul^{1*}, Taryn Young¹, Stevan R. Bruijns² and Mike Clarke^{1,3}

Abstract

Background: Methods on developing new (de novo) clinical practice guidelines (CPGs) have received substantial attention. However, research into alternative methods of CPG development using existing CPG documents (CPG adaptation) — a specific issue for guideline development groups in low- and middle-income countries — is sparse. There are only a few examples showcasing the pragmatic application of such alternative approaches in settings with time and budget constraints, especially in the prehospital setting. This paper aims to describe and strengthen the methods of developing prehospital CPGs using alternative guideline development methods through a case study design.

Methods: We qualitatively explored a CPG development project conducted in 2016 for prehospital providers in South Africa as a case study. Key stakeholders, involved in various processes of the guideline project, were purposefully sampled. Data were collected from one focus group and six in-depth interviews and analysed using thematic analysis. Overarching themes and sub-themes were inductively developed and categorised as challenges and recommendations and further transformed into action points.

Results: Key challenges revolved around guideline implementation as opposed to development. These included the unavoidable effect of interest and beliefs on implementing recommendations, the local evidence void, a shifting implementation context, and opposing end-user needs. Guideline development and implementation strengthening priority actions included: i) developing a national end-user document; ii) aligning recommendations with local practice; iii) communicating a clear and consistent message; iv) addressing controversial recommendations; v) managing the impact of interests, beliefs and intellectual conflicts; and vi) transparently reporting implementation decisions.

Conclusion: The cornerstone of a successful guideline development process is the translation and implementation of CPG recommendations into clinical practice. We highlight key priority actions for prehospital guideline development teams with limited resources to strengthen guideline development, dissemination, and implementation by drawing from lessons learnt from a prehospital guideline project conducted in South Africa.

Keywords: Guidelines, Prehospital, Qualitative, Case study, South Africa, Emergency medicine, Paramedic, Recommendations, Guideline development, Guideline adaptation

* Correspondence: mmccaul@sun.ac.za

¹Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, Cape Town, South Africa

Full list of author information is available at the end of the article



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Introduction

The methods for creating de novo (new) clinical practice guidelines (CPGs) have been well developed and are supported by numerous examples and standards [1–3]. However, de novo CPG development is often an expensive, time consuming, and human resource-intensive process that is out of reach for guideline development groups in resource-poor settings. As such, various alternative methods for CPG development have been proposed (termed CPG adaptation). These methods avoid re-inventing the wheel by drawing on existing up-to-date high quality CPGs to make recommendations that are locally applicable [4–10]. However, relative to de novo methods, there is a paucity of pragmatic case studies, specifically in prehospital care for developing guidelines or protocols. Displaying the application and challenges of such methods in resource-constrained settings is important, especially considering the attractiveness of adaptation methods due to cost and time savings [11].

One reason for this is that adaptation methods are still underused in prehospital care. A 2018 landscape analysis of 276 prehospital CPGs indicated less than 8% of CPGs used adaptive methods, with less than 2% of all CPGs originating from low-to-middle income countries (LMICs) [12]. This resulted in a call by the authors to showcase pragmatic applications of adaptive guideline development methods in resource-poor settings for prehospital care and to develop capacity for local guideline developers to use adaptation methods [13]. Supporting this, guideline developers have an expanding pool of up-to-date high quality international prehospital CPGs that can be adapted for their local setting, using a variety of methods. Furthermore, research and guideline development for prehospital care is unique due to the emergency setting, making trials difficult, adding to the general paucity of prehospital evidence. The prehospital setting is also varied across countries, ranging from informal first aid responders to doctor-lead helicopter services, making generalisability of evidence problematic.

Most alternative methods follow similar steps to de novo development, except they draw on existing high-level evidence (CPGs or systematic reviews) to develop recommendations, instead of doing their own syntheses of primary level evidence in new systematic reviews. Examples include adopting, adapting, or contextualising guideline recommendations to a local setting, which has successfully been implemented in LMICs [11, 14]. Other methods simply fast track or remove certain steps, as proposed by the G-I-N accelerated guideline working group, or adapt existing CPGs (The ADAPT process) [15, 16]. Schunemann et al (2016) developed a process of incorporating the GRADE Evidence to Decision (EtD) framework in developing CPGs from existing systematic reviews [8].

Despite these various methods, examples are rare and very few have been described in prehospital care, with most CPGs in this context still being developed de novo, predominantly in high-income settings [11].

Most examples of alternative guideline development methods in prehospital care use a hybrid combination of synthesising primary evidence (de novo methods) and adaptation methods [12]. Globally, these methods are poorly described, which is not surprising as quality reporting criteria for alternative guideline development methods do not exist, although work is in progress [17]. Even AGREE II, a guideline quality appraisal tool, does not make provision for adapted CPG methods [3].

Guideline implementation is an essential part of the guideline process, with unique challenges and barriers, which are often context specific [18, 19]. Furthermore, in allied health, and especially in the South African prehospital setting, there is uncertainty regarding who is responsible for implementing guidelines and how this should be done [18]. Additionally, South Africa has no national guideline coordinating centre, limiting standardisation of guideline development and implementation. In order to strengthen guideline uptake, the barriers and challenges to both guideline development and implementation should be explored.

There is a clear need to describe alternative guideline methods thoroughly and describe challenges and solutions, specifically using examples relevant for resource-poor settings (e.g. any setting where funds, capacity or expertise is limited), whether from high or low-to-middle income countries. This paper helps to fill this gap by describing the methods and challenges of developing and implementing prehospital CPGs using alternative guideline development methods through a case study design.

Methods

Study design

We qualitatively explored a CPG development project conducted in 2016 for prehospital providers in South Africa as a case study. This case study aims to strengthen CPG development in low resource settings by presenting an in-depth understanding of the case, particularly by describing the methods, processes, barriers, challenges, and solutions of the case. Intrinsic case studies intend to illustrate and detail a unique case within a bounded system and are appropriate when intending to develop an in-depth understanding and analysis of a clearly defined project [20]. We purposefully sampled a single guideline project, led by the African Federation for Emergency Medicine (AFEM), and key role-players in the project. The COREQ (Consolidated criteria for reporting qualitative research) statement, the current

gold standard in qualitative research reporting [21], guided our research and write up.

The case: African Federation for Emergency Medicine CPG project

The Health Profession Council of South Africa Professional Board of Emergency Care (HPCSA PBEC) awarded a bid to revise the current emergency care protocols to the AFEM, collaborating with the Centre for Evidence-based Health Care (Stellenbosch University) and the Department of Emergency Medical Sciences (Cape Peninsula University of Technology) in late 2015. The final CPG was submitted to the HPCSA PBEC in June 2016 [22]. The project's mandate was to develop a contextually appropriate CPG for prehospital care in South Africa that is patient centred, based on best evidence, and aligned to the current and future prehospital educational bands [23].

This case study is set within this AFEM project, methods described previously [11], where the temporal boundaries of the case start with drafting a collective bid to develop the prehospital CPG (in early 2015) and ends in middle to late 2017, approximately one year after submission of the guideline to the PBEC. Key stakeholders in the project include members of the guideline panel, the PBEC, the project guideline methodologists, and advisory panel members. The case boundaries are set wide so that a holistic case can be presented, taking into account all aspects of the case including topics considered outside of the project's original mandate such as guideline dissemination and implementation.

Participants

Key informants were purposefully sampled in order to maximize the diversity of data relevant to the study aims. We invited participants from the guideline funders ($n = 1$), core guideline panel ($n = 4$) and the guideline advisory board ($n = 6$) via email or telephone. Unfortunately, the guideline funders (HPCSA PBEC), due to certain regulatory processes in relation to ongoing stakeholder engagement, were unable to contribute further to this research project (MM 2019, personal communication, 19 August 2019) and, thus, our sample comprises a total of 10 participants. Supportive material included the AFEM guideline document, guideline panel meeting minutes, and interview and focus group notes.

Data collection

We collected and integrated various forms of qualitative data, from focus groups and in-depth interviews to meeting notes and case documents for an in-depth understanding of the case. Interviews were conducted during March and April 2019 in boardrooms or venues appropriate for the participants, such as personal offices or over Skype. Each interview lasted approximately 40 min. A focus

group was conducted for the core guideline panel to enrich the depth of the data. Only participants and investigators were present during the in-depth interviews and focus groups. An independent, experienced qualitative researcher (KG, Extraordinary Professor, PhD) facilitated the focus groups and interviews as the primary investigator (MM) was involved with the CPG development as a guideline panellist. He (MM, Senior lecturer, MSc) acted as the scribe and was present during the in-depth interviews to take notes and manage recordings. At focus groups, an informal conversational atmosphere was promoted. During focus groups, participants faced each other in a circular boardroom arrangement, to promote a relaxed and comfortable atmosphere. Focus group and individual interviews were recorded electronically and transcribed verbatim for analysis. Transcripts were returned to participants for comment (member checking) and adjustments incorporated. Data saturation was discussed among the author team.

Data were collected via a semi-structured interview schedule (Additional file 1) for individual in-depth interviews and focus groups. Since the guideline project occurred in late 2016 and some participants might suffer from recall bias, participants were emailed the final CPG and some recent publications around the guideline, describing processes and factors leading up to the guideline and beyond as a terms of reference document [11, 13, 24, 25]. They were also sent the overarching topics for potential discussion, to help them prepare. As such, participants were aware *a priori* of the research and reasons for doing the research.

Data analysis

Transcribed data were analysed thematically by MM with an inductive approach through manual coding [24]. Codes and themes were discussed and reviewed among the author team. All transcripts were read as a whole to familiarise the analysts, followed by a process of condensing verbatim text into condensed meaning units. Next steps involved labelling condensed meaning units by formulating codes and then grouping these codes into categories. Where appropriate, with sufficient data depth (and higher levels of abstraction), categories merged into themes, and across themes into overarching themes. Themes and overarching themes were presented graphically and grouped within the adaptive CPG development process [11], similar to a coding tree (Additional file 2). Themes originating outside of a guideline development framework were still reported and coded.

Trustworthiness and reflexivity

In this study, we sought to ensure that the research process was trustworthy, so that the findings could be considered a credible reflection of reality [25]. Several measures were taken to establish credibility, dependability,

confirmability, and transferability. These included peer scrutiny of the project, data and analysis, description of study context, debriefing sessions, independent experiences of facilitators for interviews and focus groups, iterative questioning, purposeful sampling, rich use of quotations from participants, member checking, and reflection of research beliefs and assumptions.

Throughout the study, we attempted to adhere to the methodological principle of reflexivity [25]. The principle investigator (MM) has a background in prehospital emergency care and was involved as a methodologist in the AFEM Emergency Medical Services (EMS) CPGs as a core guideline panel member. During analysis, MM drew from his lived experiences as an AFEM guideline panel member and past guideline research [11–13, 22, 23] to explore the latent meaning of text. However, as noted above, focus group and interviews were facilitated by an independent experienced researcher with MM acting as a participant during a focus group (as an AFEM guideline panel member). This linkage meant that most participants were aware of the research.

Ethics

Ethics approval was obtained from the Stellenbosch Faculty of Medicine and Health Sciences ethics committee (S17/03/069). Written informed consent was obtained from participants.

Results

Participants

We conducted six in-depth interviews and one focus group ($n = 4$). All participants were involved in the AFEM guideline project and represented various facets of the guideline process. These include the advisory boards, core guideline panel, and project management. Due to the relatively small size of the project, further details of participant characteristics cannot be detailed, to protect anonymity. Unfortunately, the funders of the project were not available for interviews.

Results overview and themes

Due to the inductive nature, emerging themes centred on existing challenges and potential solutions to strengthen prehospital guideline development and implementation. This is reflective of the current context of the guideline process, where the primary concern is guideline dissemination and implementation, as opposed to guideline development.

Overarching themes emerging from the data are grouped according to the guideline development process as shown in Fig. 1, namely challenges, recommendations, and priority actions. Themes are not mutually exclusive, as there was often overlap. However, this grouping aids in unpacking the bigger picture, exploring relationships and describing the larger narrative within the case study boundaries. Results are

summarised and presented according to the challenges linked to the chronological guideline processes (Fig. 1) and eventually to priority actions for guideline development and implementation (Fig. 2).

Successes

CPG and scope of practice impact: majority benefited with expanded access and care options

Participants felt that the CPGs produced positive change to prehospital care in South Africa, by updating outdated clinical practice to the vast majority of providers, advocating access to improved medicines and interventions by guiding policy change and enabling curriculum updates for new providers. This was especially true for example ‘around non-controversial topics like fluid administration’ and interventions or practices relevant to the majority of providers, including basic ambulance assistants and intermediate life support providers. The guidelines were also the first of their kind, advocating clinical practice based on the synthesis of the best available evidence, replacing decades-old practice and advocating for change.

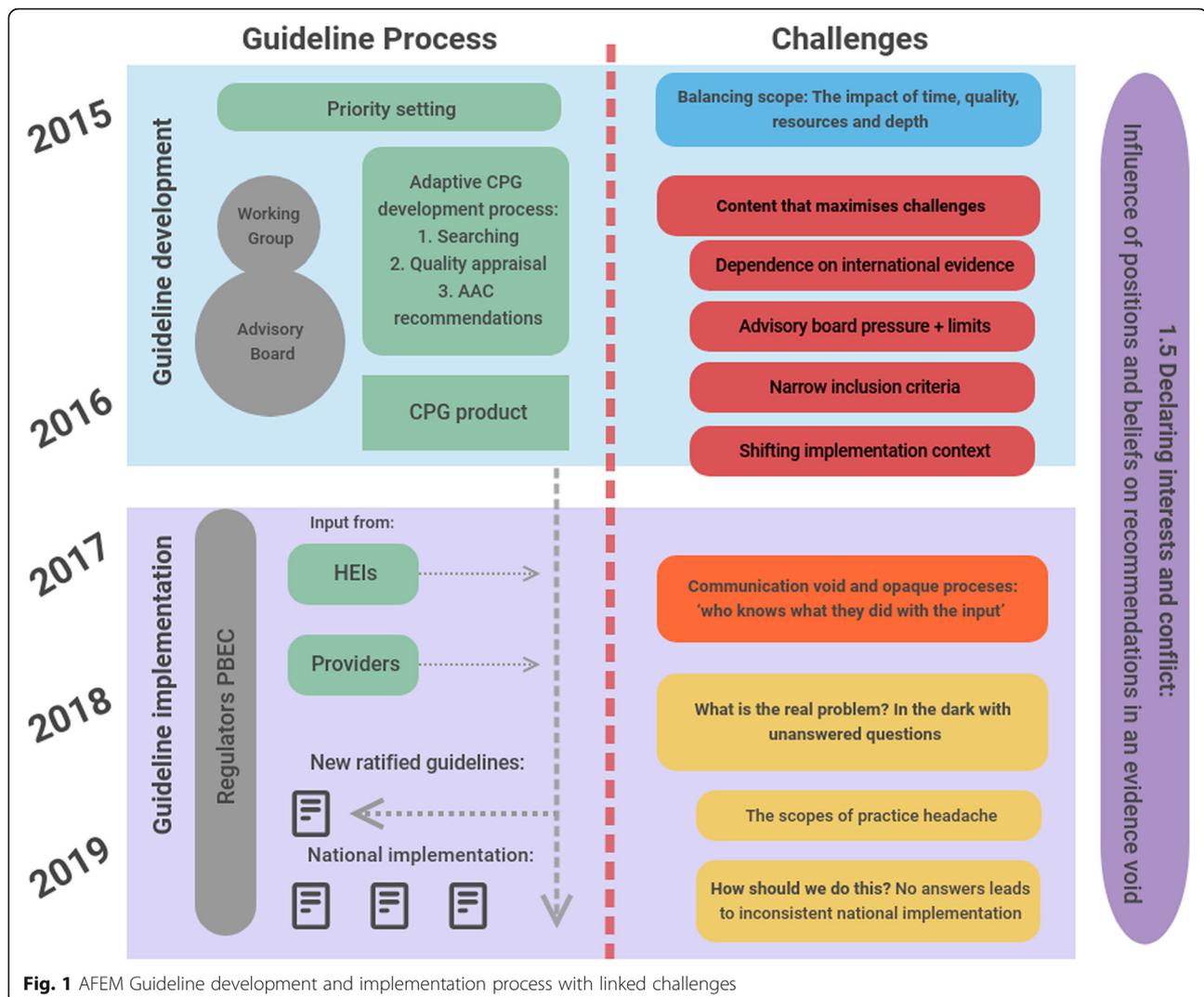
Challenges

Producing a prehospital CPG using adaptation methods was not without challenges. We unpack these challenges below, many of which are linked to guideline processes and timestamps presented in Fig. 1, where a distinction is made between challenges experienced during guideline development versus guideline implementation.

Balancing scope: the impact of time, quality, resources and depth

In this overarching theme, we explore the factors (seen as challenges) that impacted the CPG scope. Each factor is represented as a corner within an ‘iron pentagon’ (term adapted from the project management triangle), where some factors in this case study were considered constant such as budget or deadlines, creating tension in factors that can vary, like guideline scope, depth, and even quality.

A particular challenge was balancing guideline scope, which has potential to vary, with unyielding factors such as project deadlines and budget. This was a difficult space to navigate for the guideline panel, because there was competition between maximising guideline scope and quality with available resources, depth and time. ‘We [couldn’t] deal with everything, we only had 8 months’, as ‘scope was a double-edged sword: whatever we didn’t address, there would just be a void in practice’. The panel was thus ‘forced to address as many topics as [it] could, but still produce a quality product’. In the end, panellists believed that priority topics were sufficiently covered, and clear gaps were identified for future research. However, maximising scope was not without



consequences, as resources and time could have been spent on other challenges.

Context that maximises challenges

This overarching theme highlights the challenging and shifting context within which the guideline was developed and eventually implemented. A useful baking metaphor emerged in which the AFEM guideline context can be thought of as the recipe to maximise challenges: by adding a handful of local evidence gap, mixing in a shifting implementation context, baking with strict methods, and serving to opposing end-user needs. The first emerging theme was the guideline development group's dependence on international evidence, because there was no high quality, up-to-date local CPG to draw from:

'We were very dependent on international evidence. There's not a lot that we could find that's locally of

high quality that we could include that would inform clinical practice.'

This resulted in a substantial number of recommendations that needed to be adapted or contextualised to the local setting, as opposed to being adopted. This placed added pressure on the advisory board, who had little to no experience in CPG development or adaptation.

Due to the strict *a priori* inclusion criteria, which prioritised high-quality CPGs over other guidance documents such as algorithms or protocols, the process inadvertently excluded evidence that would have been useful to inform end-user document designs.

'It's not the best evidence but I think a lot of the stuff that was excluded, may have actually been helpful to inform local practice.'

Lastly, during the guideline development years *'the whole profession [prehospital emergency care providers] was shifting from a short course-based system to a professional degree-type practitioner, where we have a technician to practitioner shift'*, which complicated and directly impacted on how the CPGs have been implemented and received as industry transitioned away from training skills based short course prehospital providers.

Communication void and opaque processes: 'who knows what they did with the input'

This overarching theme stems from the perceived communication vacuum during the guideline implementation phase by regulators.

Once the CPGs were handed over, participants described a *'vacuum of communication from the board ... while clearly some internal board processes [were] going on'*. This was linked to opening the CPGs for comments from institutional and operational services and eventually the public: *'... but then again, a complete communication blackout while they considered that info presumably, but who knows what they did with the input. There is no transparency in how they took our recommendations and how it ended up with their scope of practice recommendations and having had a basically a communication void for eighteen months'*. This theme was reflected across interviews, the concern linked to the lack of communication and transparency of the decision making process, the communication void harming the paramedics, and the autocratic style of dissemination: *'"thou shalt do this", without engaging with the frontline stakeholders'*.

Implementing CPG recommendations: in the dark with unanswered questions

This overarching theme comprises four sub-themes unpacking the central issues faced within and beyond the AFEM guideline development process.

What is the real problem? The 'scopes of practice headache' A prevailing trend noted across interviews was the notion that the AFEM CPG, itself with recommendations, was not the inherent problem or issue for industry. Rather, the translation of the CPG recommendations to scope of practice (for implementation) for varying cadres of prehospital providers was described as the true *'headache'*, as *'we don't have a problem with the evidence based statements [referring to the guideline output] ... the problem is how the professional board [regulator] has interpreted some of those statements and converted them into new scopes of practice'*.

The core problem however, is not so simply explained. It is extensively complex, highlighted by various sub-themes, such as i) the paramedic and academic

disconnect: the need for understanding both ways; ii) the impracticality of engaging with the majority of providers; iii) project resource and budgetary restraints; iv) lack of implementation evidence; and v) industry maturity and lack of research experience.

Importantly, the *'scopes of practice headache'* *'mostly negatively affected a small group of well-educated and vocal people, which completely undermined the whole implementation'*. In contrast, the CPGs' recommendations and scope of practice changes impact have been overwhelmingly positive, *'as the majority of registration categories [paramedics] have benefited, as they have been given an expanded scope of practice'* and *'improved access'* and *'forced needed change'* to decades-old protocols.

How should we do this? No answers lead to inconsistent national implementation Another key sub-theme is the lack of a timely, practical implementation strategy from regulators or the national department of health as *'there is still a lot of confusion [re implementation]'*. These implementation challenges led to two sub-themes:

Unguided national implementation and end-user documentation: rising provincial training variation and provider 'upskill' exploitation

The lack of a national implementation plan and single end-user document for all provinces has led to standardisation concerns as *'each province has added its own strategy of interpreting and operationalising the guidelines'*. Moreover, there are concerns that paramedics, especially basic providers, will be exploited financially by unregulated short course training opportunities *'charging exorbitant fees if you want to upgrade'*.

Overwhelmed institutions and empty coffers lead to rote learning

This sub-theme specifically applies to qualified short course paramedics, where service providers and public training institutions are overwhelmed by the training impact of upskilling industry to the new scopes of practice. This raises various concerns and effects such as *'cost implications for new equipment'*, trainer to provider ratio imbalance, and the lack of sufficient short course training time to accommodate the expanded scope of practice.

'It is overwhelming for the time frame to fit the actual teaching and training of the new scope of drugs ... teaching them and getting them to understand, we have a huge problem.'

In summary, we unpacked the real issues, challenges and downstream effects experienced in the AFEM project, catalysed by a non-existent implementation plan from

regulators, and pressured service providers and educational institutions with limited budgets.

Declaring interests and conflict: influence of positions and beliefs on recommendations in an evidence void

In the AFEM guideline development process, conflicts of interest were handled through standard methods, by means of a conflicts of interest declaration and recording appropriate judgements if potential interests or conflicts arose. However, none did. Our data revealed that predefined beliefs, interests, history, positions, and relationships between individuals and organisations have a far greater influence on final recommendations and, specifically in this case, how they are implemented in practice, than anticipated. The theme deals with three issues: i) conflicting beliefs because of previous knowledge; ii) conflict because of knowledge of resource constraints and what best evidence is; and iii) questioning authority.

For example, one participant highlighted the influence of their own predetermined beliefs on controversial topics and noted that their *'mind about the evidence was often already made up'*. Concerns of beliefs and conflicts of interest was often centred around controversial topics such as intubation and its implementation, as opposed to uncontroversial topics such as *'who can administer aspirin for heart attacks'*. Additionally, for implementation decisions, the lack of local evidence to objectively support implementation decisions had a drastic impact on what influenced decisions, as there was *'not enough [evidence] to sway opinion'*, and thus previously held beliefs and positions around scope of practice, for example, influenced decisions.

When drafting recommendations from an advisory board perspective, managing conflict of interest was also described as an internal struggle between the recommendations (from international evidence) and what is practical in South Africa, as noted here:

"My biggest conflict of interest if you want to call it that, was knowing what is available and what is not available and what is practical and trying to reconcile that with the scientifically valid statement [recommendations], even if you don't entirely agree with it".

The concerns that advisory board members, as experts in their field, *'all come with their own bias'*, and that without experts the guideline validity would be questioned as *'a wider audience of end-users is going to say, "what do they know?"'*, were highlighted as being problematic. This can be described as a catch 22 or dilemma, where guideline validity is questioned if experts are not involved but biased if experts are involved, highlighting the importance of acknowledging the hidden influence of belief and interest in guideline development.

Overall, the challenge is managing beliefs and conflicts of interest, as this participant stated: *'the notion of belief was not well managed'*. This is an overarching concern voiced by participants, especially during guideline implementation discussions and times of discourse during the project.

Recommendations and solutions

Building from challenges identified, we present various recommendations to strengthen guideline development and implementation, which arise from this AFEM CPG case study.

End-user specific recommendations: balancing guideline delivery with paramedic capacity

During the AFEM guideline development process, the wording of recommendations was kept as close as possible to the original adapted or adopted CPGs. This overarching theme deals with how recommendations are worded, and how they should be translated to end-user content. The theme has two sub-themes: i) flexible versus prescriptive recommendations; and ii) the need for capacity-specific recommendations for different user levels.

Flexible versus prescriptive recommendations This sub-theme explores the notion of flexible recommendations, for the *'intensely trained'* paramedic, where less prescriptive wording for recommendations was advocated. More prescriptive wording was suggested for lower levels of providers as described below:

"Lower levels I think must be given very prescriptive guidelines. You must give oxygen if the child has recession."

However, controversially, it was noted that paramedics *"need room to deviate, see what works, see what doesn't work"*; paramedics thus need to be given room to deviate as *"harm could be caused if you're too prescriptive"*.

Capacity-specific recommendation for different user levels

Participants suggested different styles of recommendations and how they are presented, depending on the different users. One participant presented it as an analogy, contrasting the in-hospital to prehospital paradigm noting, *"as much as we want our paramedics to be thinking paramedics, we want them to be thinking within a defined paradigm, whereas in the hospital your paradigm is much wider or much broader"*.

In summary, this overarching theme speaks to the need for creating provider-centric recommendations, and provider-specific end-user content appropriate to

the providers' capacity and training, as noted during the focus groups:

"The upper echelon needs the CPGs, they need to have more freedom. The lower echelon needs more structured protocols".

Align local practice and international evidence: where is the evidence coming from?

Linking closely with the project's dependence on international evidence due to a local evidence void described in challenges, here we explore an emerging downstream solution. In this overarching theme, we unpack the conundrum of developing local recommendations with foreign, international evidence and present a solution.

Participants expressed the notion that in emergency care *'international evidence is sometimes the only evidence there is'*, and that local robust evidence is lacking. Some noted that there needs to be alignment of recommendations with local practice to be *'cognisant of where the research has been done ... and to contextualise'* to minimise the evidence to practice gap of *'this is not what we do locally'*. Practical examples were given to emphasise the point, including alignment of adopted World Health Organisation recommendations for treating dehydration in children and alignment of local guidance stipulated in South Africa by the Western Cape Provincial Department of Health. This theme then leads to an appropriate segue for guideline implementation solutions.

Plan for the future: Deal with controversies, focus on follow-through, not breakthrough

Even if recommendations are appropriately contextualised and aligned to local practice, recommendations can only drive uptake so far; follow-through to implementation is needed to ensure practice change. This overarching theme unpacks guideline implementation concepts and potential consequences of implementation forethought.

Implementation strengthening concepts Various suggestions were noted for future and current guideline implementation efforts. Foremost is dealing with controversies, *'like solving the airway management question that's forever thrown out ...'*, and then focusing on filling focused priority gaps via a de novo process with appropriate implementation follow through, as stated by a guideline panel group member:

"The step is to look at the gaps and I would say to do systematic reviews on those gaps, appropriately synthesise, and then take it through a guideline panel process. Similar to what we did, but for very focused questions and then come to a very clear recommendation with a clear implementation plan that can

set the record straight for those priorities, even priorities where there's a lot of implementation issues ...'

In light of follow through, various implementation and dissemination strengthening categories emerged, enabled through providing clear communication. These included: i) providing a clear and consistent implementation plan; ii) engaging with providers via roadshows or similar activities; iii) phased investigation and implementation of controversial topics; and iv) management of expectations in light of change resistance.

Despite the new CPGs having been implemented, albeit with challenges, these solutions may prove useful for current and future efforts.

Consequences of implementation forethought As noted in challenges, lack of implementation foresight was clearly a prominent concern. In this theme, we describe potential downstream consequences. A resonating concern from participants was that *'removing skills is going to impact on our patient care and our service delivery [often referring to intubation]'*, similarly with related examples of unequitable service delivery effects and consequences such as seen for interhospital transfers of neonates:

"People are going to refuse to take babies from a district to a higher level, because now the same person who came last month can't come this month, because of new rules and regulations [referring to scope changes]. What's going to happen to the baby? The baby is going to die or become very damaged" (Clinician, Advisory board member).

In summary, this overarching theme highlights the importance of evidence-based recommendations that are accompanied with an implementation 'follow through' plan, because use of evidence without implementation will most likely lead to harm.

Plugging the implementation conversation gap: open, transparent and broad dialogue

Having identified specific sequential challenges, solutions emerged to fill implementation gaps, which were specifically related to *'three, maybe four controversial topics'*. Solutions included *'addressing those [topics] openly'*, broader engagement and input from experts, national department of health and regulators, and lastly agreement from stakeholders like a *'joint legal minute ... then at least it's transparent when the scope of practice comes out'*.

In summary, this overarching theme promotes timely communication and an open, transparent decision making

process with broad engagement and agreement from stakeholders for informing national implementation decisions.

Priority actions

Based on the overarching challenges and recommendation themes that emerged from our case study, the following priority actions are recommended, summarised in Fig. 2:

Short term priority actions (0–2 years)

- Regulators and the National Department of Health, together with stakeholders, should develop national end-user-specific guidance documents which are reviewed by an independent academic body;
- Align guideline recommendations with local practice and guidance to strengthen guideline uptake and the continuum of care through contextualisation or adaptation;
- A clear, obtainable and phased implementation strategy should be communicated by regulators and

the National Department of Health to guideline end-users and stakeholders with opportunity for two-way dialogue and collaboration.

Medium term priority actions (2–5 years)

- Controversial prehospital recommendations (e.g. rapid sequence intubation) and guidance gaps should be updated and revised using transparent decision support tools (e.g. EtD) with effective implementation as an end goal;
- The impact of interests, beliefs, relationship, and intellectual conflicts must be managed when considering how CPG recommendations are developed and implemented during stakeholder engagement and input;
- Decision makers should transparently report implementation decisions to guideline end-users, detailing processes, involved stakeholders, conflicts and interests, and areas of disagreement.

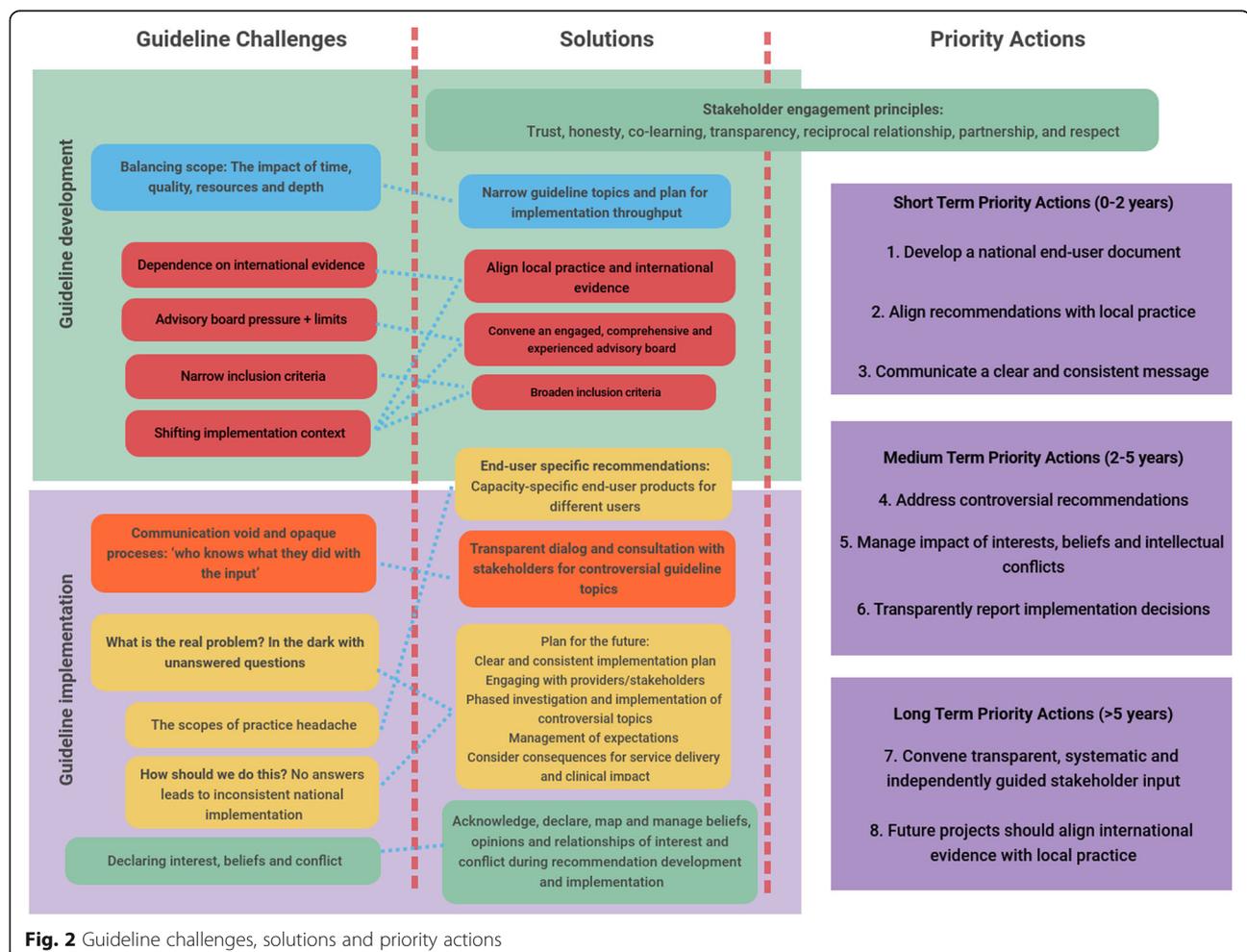


Fig. 2 Guideline challenges, solutions and priority actions

Long term priority actions (> 5 years)

- Future prehospital guideline development projects should align international best evidence with local guidance;
- Convene transparent, systematic and independently guided stakeholder input.

Discussion

True to the context and current issues faced by paramedics and stakeholders in South Africa, our results focused around unpacking the pressing challenges and linked solutions, as opposed to describing past methods, described previously [11]. Our results speak predominantly to the guideline steps after recommendations have been finalised, when decisions are made as to how recommendations are operationalised in clinical practice. Steps 14 (Wording of recommendations and of considerations about implementation, feasibility and equity) and 16 (Dissemination and implementation) detailed in guidelines 2.0 by Schunemann expand on these concepts, but provide little insight on how to navigate stakeholder engagement regarding implementation once recommendations have been developed in order to maximise local guideline uptake [26]. This critical juncture, the transition from evidence-based recommendations to contextually appropriate and pragmatic decisions for clinical practice and target-users, is where stakeholder engagement broke down and where further work is needed. We noted how competing interests, whether intellectual, financial or indirect (relationships or beliefs) need to be acknowledged and managed transparently, especially when engaging stakeholders and when making implementation decisions.

A priori acknowledgement and documentation of beliefs, intellectual conflicts, relationships and interests of all stakeholders, including guideline implementers, during guideline development and specifically implementation is essential. Doing so could have prevented various challenges for the AFEM guideline group. However, this is an international challenge, where strategies such as the G-I-N nine principles for managing conflicts in guideline development are continuously being updated, to address disclosure and management of competing interests [27, 28].

This is specifically important for controversial issues, where evidence and implementation strategies are often unclear, as in our case study. For these issues, when decisions around operationalisation of recommendations are made, transparency in decision-making, and management of interest and conflict is of utmost importance, as reflected by the International Committee of Medical Journal Editors updated policy on competing interests [29]. Guidelines are particularly vulnerable to the effects of conflicts and interests, due to stakeholder engagement

being a cornerstone guideline process [30]. The guideline community is setting new quality and evidence thresholds [17]; however, in considering evidence, guideline groups must consider the appropriateness of evidence. This is especially true for CPGs using adaptation methods, where an assessment of the generalisability and acceptability of evidence to context and guidelines users is often absent in dialogue. Thus, even in such challenging dialog it is paramount transparency of decisions is held, especially in the face of conflicts of interest. Furthermore, we identified various universal themes this case study experienced across jurisdictions and health care challenges such as scope of practice issues, boundaries of implementation and overwhelmed institutions [18, 19, 31–33].

Assisting with this vulnerability, the GRADE EtD framework is a useful primer for controversial issues, as guideline panellists transparently document and deal with issues such as feasibility, acceptability, resources and equity, with the EtD process ending only when a recommendation has been ratified [34]. However, useful CPG adaptation examples exist from LMICs, showcasing various methods of strengthening guideline uptake by considering local issues either through qualitative research or stakeholder engagement during and after recommendations have been drafted [33]. However, evidence is still inconclusive whether CPG adaptation methods are superior to *de novo* methods. Often time and cost is cited as advantageous for CPG adaptation, however stronger evidence is needed with equivalent comparisons or better insight into different contexts and their available resources. Useful lessons can be adopted for future prehospital projects in creating fit-for-purpose and efficient CPGs, such as conducting a contextual analysis and integration of end-user needs into guideline recommendations [7] or using hierarchical search strategies [6]. Other *a priori* solutions include establishing the rationale for engaging stakeholders, identifying stakeholder communities, how engagement will work (roles and modes), and importantly what conflicts of interest procedures and conflict management resources are needed [35], of which various exist [27, 28, 34]. Furthermore, when considering implementation decision domains such as acceptability or feasibility, qualitative evidence synthesis, a research area lacking in emergency medicine and prehospital care, should be considered [36].

For the South African EMS setting, we recommend a phased implementation approach, showcased in allied health stroke guidelines, where an ideal timeline is linked to recommendations that cannot be adopted immediately [10]. This would be useful for controversial and complex interventions such as intubation, prehospital thrombolysis or scalp vein cannulation for infants. We further recommend, for the South African EMS and similar settings, creating end-user specific documents, such as strict protocols for short course trained paramedics and more flexible

guidance documents for higher qualified paramedics, of which useful examples exist in primary health care for nurses [37, 38] and emergency medicine [39].

It is refreshing to see progress being made by the HPCSA PBEC, which has started addressing prehospital end-user needs and challenges highlighted previously [22, 40] by regulating paramedic CPG updates, releasing a CPG FAQ [41] and seeking approval of new medicines and interventions. However, in order to equip paramedics to make decisions based on the best available evidence, all national decision makers will need to engage in collaborative action, where short to long term priority actions provide guidance.

This study has a key limitation: we were unable to interview the HPCSA PBEC, which would have provided valuable insight into the South African regulatory framework and implementation challenges from their perspective. Although the National Department of Health was not part of the bounded AFEM case, its role in downstream implementation to date, including the HPCSA PBEC, is an essential perspective and future research exploring the recommendations to implementation gap should incorporate these stakeholders. Additionally, our research reflects the perceptions and thoughts of an influential but relatively small group of people, each with their own agenda and biases. Furthermore, our research does not shed light on incorporating patient perspectives for prehospital guidance but rather on engagement of guideline end-users and decision makers.

Conclusion

The cornerstone of a successful CPG development process is the translation and implementation of CPG recommendations into clinical practice. We highlight time-sensitive priority actions for prehospital guideline development or adaptation teams, national departments of health, regulators and the prehospital industry in South Africa to strengthen guideline development, dissemination and implementation by drawing from lessons learnt from the AFEM prehospital guideline project. We also highlight challenges during stakeholder engagement when implementing guideline recommendations. These need to be addressed if guideline uptake and implementation is to be strengthened.

Supplementary information

Supplementary information accompanies this paper at <https://doi.org/10.1186/s12913-020-05111-x>.

Additional file 1. Semi-structured interview schedule (Example Interview 1).

Additional file 2. Alternative guideline development process.

Abbreviations

AAC: Adapt, adopt or contextualise; AFEM: African Federation for Emergency Medicine; AGREE II: Appraisal of guideline research and evaluation; COREQ: Consolidated criteria for reporting qualitative research; CPG: Clinical practice guideline; EMS: Emergency Medical Services; EtD: Evidence to

Decision; G-I-N: Guidelines International Network; HEI: Higher Education Institution; HPCSA: Health Professions Council of South Africa; LMICs: Low- and middle-income countries; PBEC: Professional Board of Emergency Care

Acknowledgements

We acknowledge the AFEM CPG team and advisory board members for their support. We thank Prof Karin Grimmer for her input and support, especially for facilitating the interviews and focus groups. Additionally, we thank Lynn Hendricks for her thoughts and comments and Jason du Toit for editing.

Authors' contributions

MM conceptualised the research idea, collected data, performed the analysis and wrote the first draft of the manuscript. MC, TY and SB provided analytical support, oversight and supervision of the research. All read and approved the final version of this manuscript.

Funding

No sources of funding to declare.

Availability of data and materials

As this study analyses qualitative data and participants did not consent to have their full transcripts made publicly available, data excerpts are available from Stellenbosch University Research Data Repository for researchers who meet the criteria for access (<https://scholardata.sun.ac.za/>).

Ethics approval and consent to participate

Ethics approval was obtained from the Stellenbosch Faculty of Medicine and Health Sciences ethics committee (S17/03/069). Written informed consent was obtained from participants.

Consent for publication

Not applicable.

Competing interests

MM was involved as a guideline methodologist and evidence reviewer in the original AFEM CPG commissioned via the HPCSA PBEC. TY was involved as an evidence synthesis methodologist and consultant. Neither AFEM or the HPCSA PBEC was involved with the interpretation or final write up of this manuscript.

Author details

¹Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, Cape Town, South Africa. ²Division of Emergency Medicine, University of Cape Town, Cape Town, South Africa. ³Centre for Public Health, Queen's University Belfast, Belfast, Northern Ireland, UK.

Received: 20 August 2019 Accepted: 13 March 2020

Published online: 24 April 2020

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

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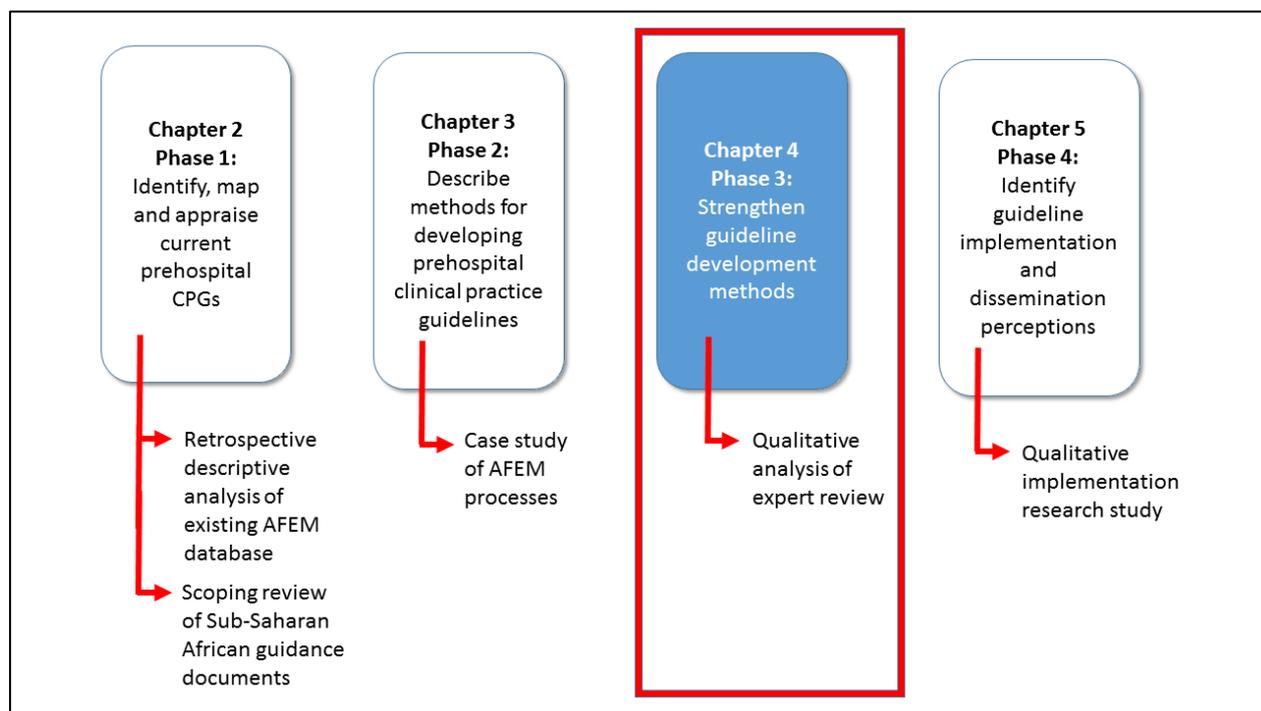
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Chapter 4: Strengthen guideline development methods

Strengthening guideline development and implementation in South Africa: Reflections from guideline experts



Summary, publications and linked presentations

In this chapter, I strengthen alternative guideline development methods, through a qualitative analysis of expert review comments of the AFEM guideline process and through showcasing various alternative guideline development examples. This chapter includes two linked publications: i) a qualitative analysis of expert review of the AFEM guideline project; and ii) a report of four alternative CPG development methods case studies from South Africa (published), linked to the [South African Guidelines Excellence Project](#) (SAGE).

I aimed to describe the opinions of international guideline experts on the AFEM guideline project, describe and provide key considerations and approaches for alternative guideline development, and produce an improved prehospital guideline development framework. I conducted a qualitative study of expert reviews of an evidence-based guideline development project led by the AFEM in 2016 for prehospital care in South Africa. I used email to purposefully sample participants from a variety of sources, including guideline organisations (i.e. WHO, G-I-N and NICE), academic institutions and evidence-based health care units (e.g. iCAHE, the University of Cape Town Knowledge Translation Unit, the Centre for Evidence-Based Practice), and national (South African) and international emergency care organisation representatives. I sought experts with experience in conducting, developing or implementing CPGs (within or outside of emergency care) or who have published extensively in the field of guidelines. Comments and voice memos, following a terms of reference guide, were thematically analysed through manual coding.

I included seven guideline experts' written reports and voice memos. Participants were from both high-income and low- to middle-income countries. Participants ranged from a variety of guideline organisations and backgrounds, from emergency medicine and primary care to allied health; from international guideline organisations to country specific guideline development or research units involved with guideline production; to heads of departments, senior researchers and professors. Key themes revolved around the sufficiency of CPGs as research evidence, blurring of guideline

responsibilities and output and transparency of guideline decisions and conflicts of interest. I showcase three fit-for-purpose guideline development approaches and provide an updated alternative guideline development roadmap for resource-limited settings.

In conclusion, in order to create CPGs that clinicians trust and use on a daily basis to change lives, guideline developers need rigorous yet pragmatic approaches that are responsive to end-user needs. Reflecting on the AFEM prehospital guideline development project in 2016, I presented key guiding themes to strengthen guideline development in LMICs and other resource-limited settings and provided an updated hybrid guideline development approach.

In addition, the SAGE held a workshop in 2017 to provide an opportunity for dialogue regarding different approaches to guideline development with key examples and case studies from the South African setting. Four CPGs represented the topics of mental health, health promotion, chronic musculoskeletal pain and prehospital emergency care. However, each CPG used a different approach, using transparent, reportable methods. I reported on these experiences. I present four purposefully selected case studies from South Africa, displaying different approaches for adapted CPG development. This draws from the SAGE, a multi-partner research initiative aimed at supporting the understanding of standards of national CPG development, adaptation, implementation and capacity building.

PUBLICATIONS

1. **McCaul M**, Young T, Clarke M. Strengthening prehospital clinical practice guideline development and implementation in South Africa: Reflections from guideline experts. *African Journal of Emergency Medicine*. 2020. (accepted for publication, in proofing)

African Journal of Emergency Medicine (<http://www.afjem.com/>), Impact Factor: 0.88, h-index: 12. Open Access. Ranked 4th regionally for citations and 2nd for views.

Author contributions: MM conceptualised the research idea, collected data, performed the analysis and wrote the first draft of the manuscript. MC and TY provided analytical support, oversight and supervision of the research. All authors contributed to writing the manuscript, approved the final version and met the ICMJE criteria for authorship.

2. **McCaul M**, Ernstzen D, Temmingh H, et al. Clinical practice guideline adaptation methods in resource-constrained settings: four case studies from South Africa. *BMJ Evidence-Based Medicine* Published Online First: 10 July 2019. doi: 10.1136/bmjebm-2019-111192. <https://ebm.bmj.com/content/early/2019/07/10/bmjebm-2019-111192>.

BMJ Evidence-Based Medicine (<https://ebm.bmj.com/>), Impact Factor: 0.55, h-index: 23. Open Access.

Author contributions: MM and TK conceptualised the research idea. MM wrote the first draft of the manuscript, supported by TK. MM, ED, TH and BD contributed to the individual case studies. MG contributed to editing, management and referencing. All authors contributed to writing the manuscript, approved the final version and met the ICMJE criteria for authorship.

LINKED PRESENTATIONS

McCaul M, Galloway M, Ernstzen D, Temmingh H, Draper B, Kredo T. Adaptive clinical practice guideline development methods in resource-constrained settings – four case studies from South Africa. G-I-N 2018, Manchester, UK. (Poster presentation)

McCaul M, Galloway M, Ernstzen D, Temmingh H, Draper B, Kredo T. Adaptive clinical practice guideline development methods in resource-constrained settings – four case studies from South Africa. African Cochrane Indaba 2019, Cape Town, South Africa. (Poster presentation)

McCaul M, Draper B, Temmingh H, Ernstzen D. Shifting the way we do it: Clinical practice guideline adaptation. SAGE Panel Discussion Day. 20 April 2017. Cape Town, SA. (Oral presentation and Panel Member). YouTube Link: <https://youtu.be/n4ReDJe3Up8>. Accessed 8 July 2020.

APPENDICES

Appendix 4.1 Social Media Engagement

Strengthening prehospital clinical practice guideline development in South Africa: Reflections from guideline experts

Michael McCaul^{a,*}, Taryn Young^a, Mike Clarke^{a,b}

^a Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, South Africa

^b Centre for Public Health, Queen's University Belfast, Northern Ireland, United Kingdom

ARTICLE INFO

Keywords

Prehospital
Alternative guideline development
Expert review
Clinical practice guidelines
Qualitative research

ABSTRACT

Introduction: *De novo* (new) guideline development methods are well described and supported by numerous examples, including comprehensive checklists. However, alternative guideline development methods, which draw from existing up to date, high quality clinical practice guidelines instead of re-inventing the wheel, have not been adopted so readily, despite the potential efficiencies of such methods compared to *de novo* development. In Africa, guideline quality and rigour of development, especially for prehospital care, remains poor. This paper firstly describes the opinions of international guideline experts on the African Federation for Emergency Medicine guideline project, and secondly updates a framework for South African prehospital guideline development.

Methods: We conducted a qualitative study of expert reviews of an evidence-based guideline development project led by the African Federation for Emergency Medicine in 2016 for prehospital care in South Africa. We purposefully sampled key international and regional guideline experts from a range of organisations. Comments and voice memos, following a terms of reference guide, were thematically analysed through manual coding.

Results: A total of seven experts gave feedback. Key themes revolved around existing international clinical practice guidelines not being enough to cover context specific evidence, blurring of guideline responsibilities and output, and transparency of guideline decisions and conflicts of interest. We showcase three fit-for-purpose guideline development approaches and provide an updated alternative guideline development roadmap for low-resource settings.

Conclusion: In order to create clinical practice guidelines that clinicians trust and use on a daily basis to change lives, guideline developers need rigorous yet pragmatic approaches that are responsive to end-user needs. Reflecting on the African Federation for Emergency Medicine prehospital guideline development project in 2016, this paper presents key guiding themes to strengthen guideline development in low- and middle-income countries and other low-resource settings and provides an updated hybrid guideline development approach.

Introduction

De novo (new) guideline development methods are well described and supported by numerous examples, including comprehensive checklists [1]. However, alternative guideline development methods, which draw from existing up to date high quality clinical practice guidelines (CPGs) instead of re-inventing the wheel, have not been adopted so readily, despite the potential efficiencies of such methods compared to *de novo* development [2]. Alternative guideline development methods include a variety of robust approaches, such as the ACA (adopt, contextualise or adapt), adolpment and use of the ADAPT framework [1,3,4]. These have been applied across various topics and disciplines including emergency care, stroke rehabilitation, psychiatry and chronic musculoskeletal pain [5].

However, within emergency care, *de novo* guideline development methods continue to be predominantly used when developing CPGs. A 2018 landscape analysis of global prehospital CPGs found that nearly 60% of prehospital CPGs were developed *de novo*, with less than 2% using alternative methods [6]. Guideline quality also varied, with a lack of methodological clarity in 32% of global emergency care CPGs. Furthermore, in sub-Saharan Africa (SSA), a similar scoping review found that 71% of emergency care guidance documents, including clinical care pathways and protocols, failed to report appropriate development methods or reference parent CPGs [7]. In SSA, the majority of emergency care guidance are produced by professional societies (58%), followed by national departments of health (21%) and academic/clinical institutions (19%), reflecting similar trends reported from high-income regions [6]. These trends are seen in other spheres, such as the primary

* Corresponding author.

E-mail address: mmccaul@sun.ac.za (M. McCaul)

care setting, where a cross-sectional analysis of selected CPGs highlighted guideline quality issues, especially in rigour of development, editorial independence and applicability [8].

Considering the substantial burden of trauma in Africa, it is essential that robust, high-quality guidance is produced and available for prehospital providers [9]. Although most SSA prehospital guidance documents seem to be end-user focused, many lack transparent reporting to support their clinical recommendations [10–13]. This speaks to the urgency of promoting and strengthening the transition from eminence-based to evidence-based guidance for prehospital care in SSA. However, in strengthening both the development and implementation of CPGs in low- and middle-income countries (LMICs), especially alternative guideline methods, significant progress has been made both locally and internationally.

Indeed, many of the methods for advancing alternative guideline development have originated from Africa in the past 5 years [14], with numerous examples and case studies emerging to guide developers [4,5,15–22], including online toolkits [23]. Examples include stroke [22], mental health [5], and emergency care [21], all of which have used alternative guideline development methods that are context-specific and fit for purpose for a LMIC setting. For example, in allied health, Ernstzen et al. [20] describe a four-phased contextualisation framework to produce a multidisciplinary CPG for primary health care of adults with musculoskeletal pain. Sampling patients' and practitioners' perspectives and preferences, they were able to contextualise/adapt recommendations to fit the local setting and needs [20]. Additionally, user-friendly and pragmatic clinical decision tools exist that can be used as templates for adaptation considering the best available evidence, such as those produced by the Emergency Medicine Kenya Foundation [11]. Other guideline development methods include streamlined *de novo* approaches such as used by the Belgium Red Cross in developing first aid CPGs for first responders in Africa [24], to end-user-centric approaches for developing clinical decision tools for primary care nurses [16]. These methods and examples, among others mentioned, will play an important role in shaping emergency care guideline development where resources are scarce.

In South African emergency care, progress has been made to transition to evidence-based clinical practice guidelines [25] with the African Federation for Emergency Medicine (AFEM) producing the first prehospital CPG for paramedics in South Africa [26]. Recent developments include scoping and appraisal of SSA prehospital guidance documents [7], critical reflections on guideline methods and roadmap of the AFEM guideline development approach [21], case studies [5,27], and exploration of paramedic perceptions to strengthen CPG uptake [28]. These have resulted in key priority actions to strengthen local prehospital guideline development and uptake, enhanced with knowledge translation activities [29]. However, various challenges still exist for guideline developers who use alternative methods, especially in emergency care. These include a lack of high-quality 'seed' guidelines to adapt or adopt, challenges in pooling recommendations from multiple guidelines, a complex and shifting implementation context, lack of experience in guideline development groups, and the undue influence of conflicts of interest and beliefs when considering recommendations for implementation [21,30–32]. Furthermore, when developing CPGs using alternative methods, even though these methods focus on implementation readiness, it does not automatically lead to successful implementation despite the availability of useful tools to aid in implementing CPGs [33].

In looking for solutions, a consolidated updated roadmap to successful guideline development and implementation would help strengthen future guideline projects for emergency care in South Africa and beyond, building on previously published challenges, roadmaps and lessons learnt by the AFEM prehospital CPG project [21,27,28]. This paper firstly describes the opinions of international guideline experts

on the AFEM guideline project, and secondly aims to update a framework for South African alternative prehospital guideline development by consolidating expert input.

Methods

Study design

We conducted a qualitative study of expert reviews of the AFEM guideline development project to explore their opinions on methods to strengthen guideline development and implementation, and provide a roadmap and update for future development and implementation of South African prehospital CPGs. We purposefully sampled key international and regional guideline experts, from a range of universities and organisations. We asked them to provide their comments on three AFEM-linked guideline publications [21,27,28] in writing or as a voice memo. The COREQ (Consolidated criteria for reporting qualitative research) statement guided our research reporting [34]. Ethics approval was obtained from the Stellenbosch Faculty of Medicine and Health Sciences ethics committee (S17/03/069). Written informed consent was obtained from participants.

Participants

Key guideline experts were purposefully sampled in order to maximise the diversity of data relevant to the study's aims. We used email to invite participants from a variety of sources, including guideline organisations (*i.e.* World Health Organisation, Guidelines International Network and National Institute for Health and Care Excellence), academic institutions and evidence-based health care units (*e.g.* International Centre for Allied Health Evidence, University of Cape Town Knowledge Translation Unit, Centre for Evidence-based Practice), and national (South African) and international emergency care organisation representatives. We sought experts with experience in conducting, developing or implementing CPGs (within or outside of emergency care) or who have published extensively in the field of CPGs, who would be able to provide adequate feedback in the allocated timeframe. We aimed to have a 1:1 ratio of local *versus* international guideline experts. A relationship was established *via* email before data collection, where most participants knew the researcher through professional networks.

Data collection and analysis

Participants received a terms of reference pack, which included study objectives and three documents: i) an AFEM CPGs methods paper, reflecting on challenges and lessons learnt [21]; ii) an AFEM CPG qualitative case study [27]; and iii) a study of paramedic guideline implementation perception challenges [28]. We also included a series of semi-structured prompting questions to guide their expert review (Supplementary File).

We collected two types of data from participants: i) written reports; and ii) self-recorded voice memos. Reports and voice memos were sent *via* email to the principle investigator (MM) and kept in a password-secure location. Voice memos were transcribed verbatim for analysis. Transcribed data were analysed thematically by MM with a deductive approach, based on the AFEM guideline process as an overarching guide [21], through manual coding as described by Erlingsson and Brysiewicz [35]. Themes were discussed among the author team. All transcripts were read as a whole to familiarise the analysts, followed by collapsing verbatim text into condensed meaning units. Next steps involved labelling condensed meaning units by formulating codes and then grouping these codes into categories. Where appropriate, with sufficient data depth, categories were merged into themes and across themes, to create overarching themes. Expert guideline development

approaches were presented graphically to provide examples of guideline development.

In reviewing the AFEM methods, experts described and highlighted key approaches to strengthen development and downstream implementation. Through triangulation of previously published challenges, roadmaps and lessons learnt, we incorporated these suggestions into an updated graphical roadmap and tabulated narrative for future guideline development in resource-limited settings, considering the original AFEM methods and challenges described previously [21,28], and drawing from the themes presented in this paper.

Trustworthiness and reflexivity

We sought to ensure that the research process was trustworthy, so that our findings could be considered a credible reflection of participants' reality [36]. We took several measures to establish credibility (*i.e.* used quotes verbatim, peer scrutiny of the project), dependability (*i.e.* member checking and review of notes), confirmability (*i.e.* reflection of research beliefs and assumptions, debriefing sessions) and transferability (*i.e.* description of study context and participants, used participants terms/concepts in writing), where possible. The principle investigator (MM) has a background in prehospital emergency care and was involved as a methodologist in the AFEM CPGs as a core guideline panel member. During analysis, MM drew from his lived experiences as an AFEM guideline panel member [21,26,37] and past guideline research [23,27,28].

Findings and discussion

A total of 10 participants were invited, with three declining participation due to workload and time commitments. Participants were from both high-income and low-to-middle income countries, and three were from South Africa. Participants ranged from a variety of guideline organisations and backgrounds, from emergency medicine and primary care to allied health; from international guideline organisations to country specific guideline development or research units involved with guideline production; to heads of departments, senior researchers and professors. All experts provided written reports, while one expert provided both written and voice memo reports.

Overview and themes

Six major themes emerged from the data, summarising the various opinions and key considerations of the guideline experts regarding the AFEM guideline project. These are discussed below along with three examples of guideline development, followed by a revised roadmap for alternative guideline development and implementation for South African prehospital care, drawing from major themes and previous work [21].

Using existing international CPGs is not enough to cover context-specific evidence

Experts considered using high-quality international CPGs as an appropriate method of 'short-cutting the laborious process of searching for evidence' [Expert 1] compared to producing CPGs *de novo*. However, experts noted that when working with international CPGs, there is a risk to miss contextual evidence or context-specific interventions typically uncovered during searching for primary studies, resulting in recommendations that may not be deliverable in South Africa or any other setting.

"The understanding that 'research evidence' [guidelines] is important but not sufficient and needs to be integrated with other important forms of knowledge, is a key part of guideline devel-

opment in order to make recommendations work 'on the ground'."

[Expert 2]

Three experts recommended two similar overarching solutions presented below as subthemes, pertaining to using other forms of knowledge and evidence in alternative guideline development processes:

Use local evidence: incorporating and aligning policy, local guidance, and end-user documents

Experts advised using evidence sources such as local policies, local CPGs or guideline documents, essential medicine lists and clinical decision tools such as algorithms, to ensure recommendations '*[are] developed and grounded in a clinical setting rather than an abstract, generic manner*' [Expert 3]. Indeed, even with *de novo* methods which use the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Evidence to Decision (EtD) framework [38], local evidence around feasibility, applicability, values and preferences and resource use is sourced in order to develop context-specific recommendations. Clinical Decision Support Tools or end-user documents such as Practice Approach to Care Kit 101 [39] for primary health care nurses use local CPGs and policy as the starting point, while supplementing knowledge gaps using an evidence synthesis database (such as British Medical Journal Best Practice) [40], '*ensuring alignment to local priorities and resources*' [Expert 3]. The overarching premise was explained by Eisenberg (2002) that even when the evidence is abundantly clear, '*local circumstances dictate how that evidence is translated into practice*', emphasising the consideration of local circumstances when using global evidence such as from CPGs [41]. When and how local evidence is incorporated during guideline steps varied between experts in our study; some used local evidence as the starting point, while others only included local evidence when recommendations were to be adapted from CPGs. However, a common thread among experts was that this step be actioned within a guideline panel process.

Carefully choose the guideline panel: enabling wider consultation

Across experts, the essential nature of a balanced guideline panel was emphasised. Guideline panels allow '*evidence to be considered and mulled over, debated and developed into context-specific recommendations*' [Expert 2], and is a universal process in guideline development.

'When it comes to resource-strapped settings, primary research is most often limited, and the input of a good expert panel is especially important.' [Expert 4]

Experts suggested various stages and methods for involving experts in the guideline development process. However, all agreed that meeting face to face is the ideal format, especially to discuss and find consensus on guideline scope, questions and priority topics. Experts noted that during the AFEM guideline process, it was unclear how the expert panel engaged with the recommendations, whether this was face to face or online. Towards solutions, one expert suggested that for the AFEM CPGs, '*two types of face-to-face meetings be organised: one with content experts, and one with stakeholders or users*' [Expert 4], to create user buy-in, and further facilitating better implementation by involving stakeholders from the '*outset, throughout development and during implementation*', as part of a wider and open consultation process [Expert 3].

Blurring of responsibilities, separation of output

One expert was concerned around the impact of the AFEM CPGs beyond providing clinical guidance '*being used to define limits of professional practice in order to regulate groups of practitioners*' [Expert 1]. Experts noted the CPGs were '*doing what conventional guidelines do, which is guide clinical practice*' [Expert 5] but also noted that the CPGs were serving other purposes, including setting scopes of practice (who can

do what and when), blurring responsibilities where regulators and health authorities should have stepped in regarding guideline implementation, as 'implementation primary responsibility lies with those who are delivering the service or those who are regulating the delivery of the service' [Expert 2].

Towards future solutions, one expert advised there should be a clear separation of guideline outputs. Firstly, the guideline team should only produce the clinical guidance and, where feasible, an end-user document; and secondly, regulators or health authorities should produce a scope of practice or other regulatory framework. This would separate clinical guidance from regulatory issues which touch on sensitive areas outside of a CPG team's ambit such as 'professional identity issues, professional security and lack of clarity on future career pathing' [Expert 6]. Creating separate outputs would have helped reduce the tangling of perceptions of the evidence-based CPGs with implementation policy and scopes of practice issues, as highlighted by one South African expert:

'In retrospect, these two areas – clinical care and scope of practice may have been better in two documents. This would have allowed people to engage with them separately.' [Expert 6]

Heterogeneous methods of heterogeneous evidence classifications

Experts provided conflicting options for dealing with heterogeneous levels of evidence classifications, a common issue when dealing with multiple CPGs, each of which might use a different level of evidence classification. Some suggested a conversion table to align the different classifications systems together with a writing guide 'to ensure consistent decisions about the combined levels of evidence' [Expert 7], while others used GRADE EtD or plain language descriptions to differentiate between higher and lower levels of evidence. It was also recognised that determination of the strength of recommendations (e.g. conditional or strong) from different CPGs still requires additional research, as guideline teams often do not report their decision making or context factors that affect the strength of recommendations.

In 2016, the AFEM guideline was faced with more than 50 different evidence classifications found across 264 included CPGs, and took the approach of reporting the original plain language meaning for each classification, described previously [21]. This reduced the workload on the guideline panel, who had more than 1000 recommendations to consider, where merging levels of evidence classifications was not feasible. Alternative classification merging options in the literature include the EtD framework; but this method does not scale well with large numbers of recommendations [42], or the National Health and Medical Research Council evidence matrix [43]. However, a potentially scalable approach was proposed by Grimmer *et al*, standardising evidence strength grading for recommendations from multiple CPGs, resulting in an overall strength of the body of evidence classification [15]. Further testing is needed to determine scalability and guideline teams with less experience.

Fit-for-purpose clinical practice guidelines: snapshot of three approaches

Three key guideline development approaches used in low-resource settings, are shown in Fig. 1 (where colours indicate development stage namely planning and scope, evidence synthesis or recommendations development). Experts noted that although these approaches have predominantly been used in LMICs, due to typical restrictions in human and fiscal resources these methods are by no means inferior to the typical *de novo* guideline development methods, or less applicable in high-income settings.

The first is a streamlined *de novo* approach, which streamlines the systematic review process to save time by producing a more focused evidence review with 'lower sensitivity, which might result in missing some studies, but a balanced guideline expert panel, meeting face-to-face, serving as a backup' [Expert 4]. To save time, this approach uses one reviewer 'together with one or two content experts to prepare draft recommendations, which can be discussed during the panel meeting' [Expert 4]. As an example, this approach was successfully used by the Belgian Red Cross in de-

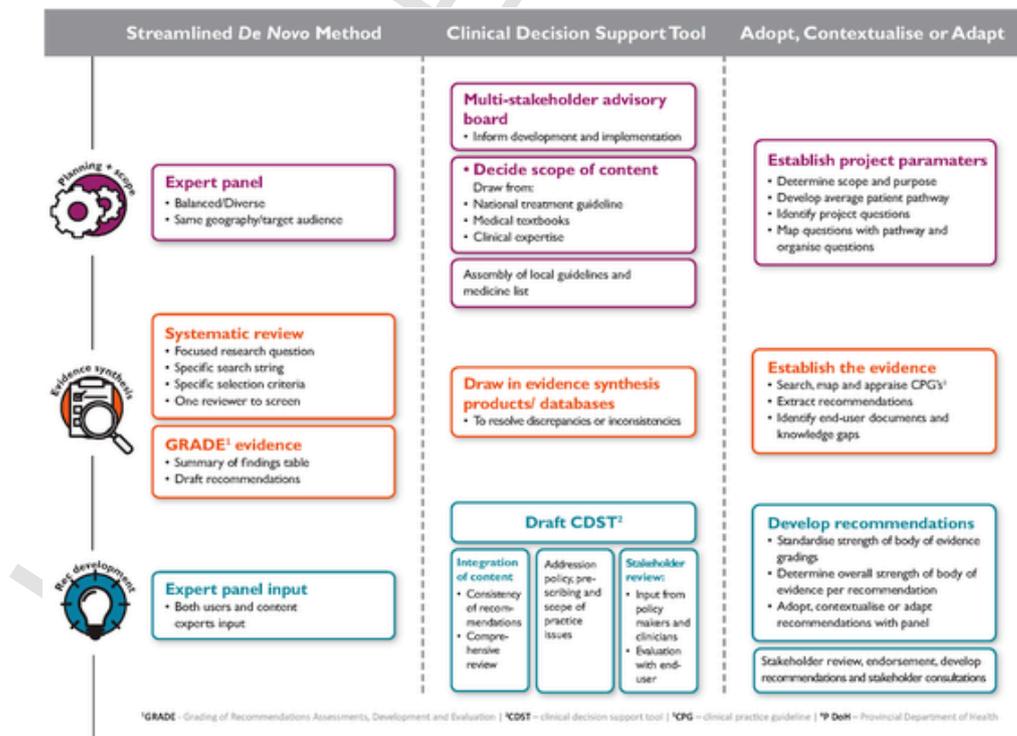


Fig. 1. Three examples of guideline development methods used in LMICs.

veloping the first evidence-based first aid guideline for first responders in Africa [44].

The second is an approach focused on producing a clinical decision support tool or an end user document (referred as a 3rd generation knowledge product) by drawing from primary studies and systematic reviews (1st generation) and local CPGs and policies (2nd generation). This approach is useful for those who 'don't have time or resources to develop first generation content de novo' and for developing an end-user template that can easily be 'updated, or adapted for in-country localisation to policy, skills and resources' [Expert 3]. Examples include the Practice Approach to Care 101 for primary care nurses [39].

The third guideline approach is structurally similar to the original AFEM approach, whereby existing CPGs or other forms of guidance are used as the evidence base, and together with a writing guide to 'amalgamate recommendations from multiple guidelines' [Expert 1], recommendations are either adopted as is, contextualised (implementation caveats added) or adapted (changed completely) to the local context needs. This approach has been tried and tested in various settings, including the Philippines [45], and in South Africa for stroke rehabilitation [46]. Another expert proposed an inverted guideline development approach, whereby i) all CPGs on a broad topic are identified; ii) recommendations are listed with strength of evidence; and iii) for each

Guideline Development Framework

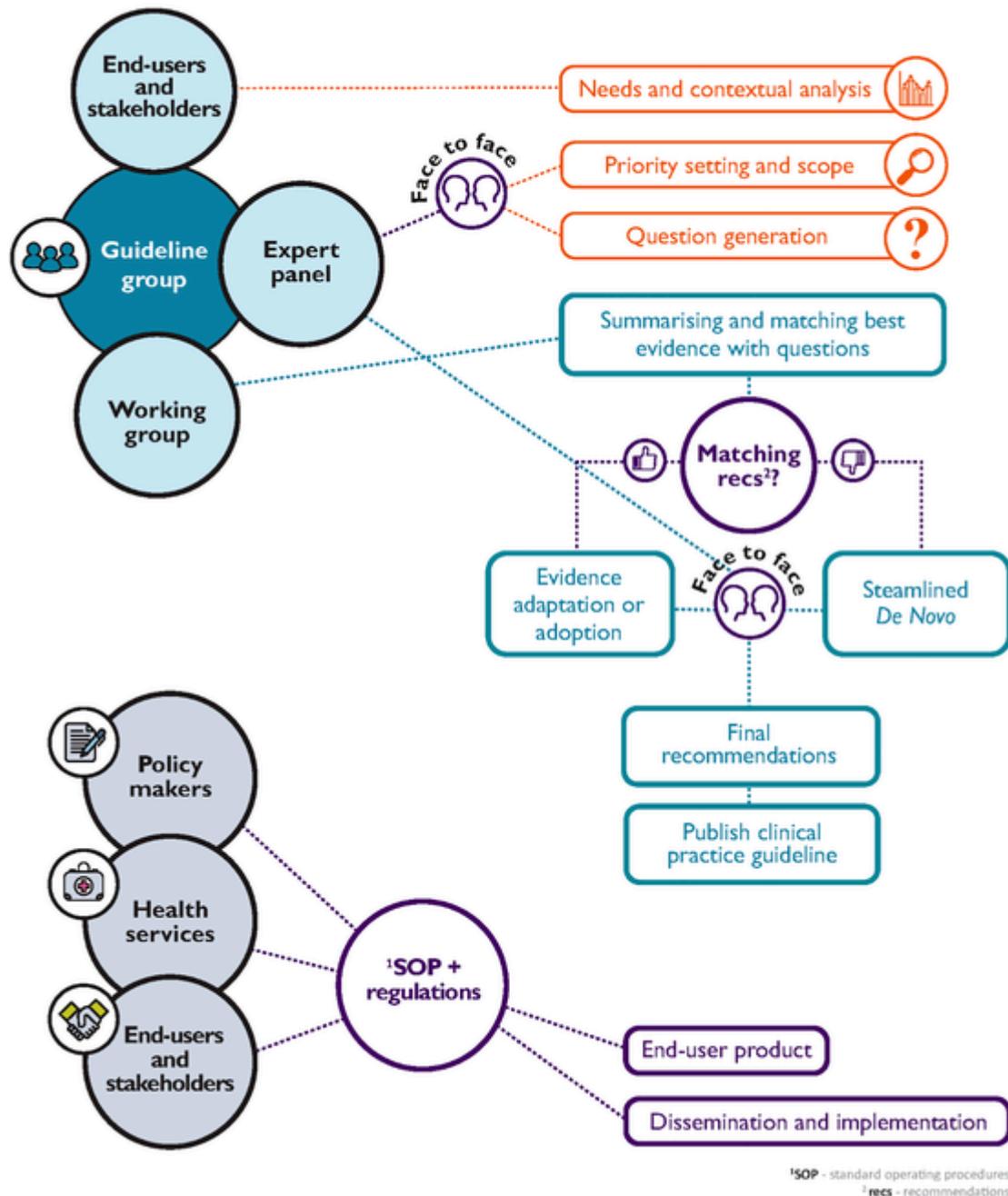


Fig. 2. Hybrid alternative guideline development approach and key considerations.

Table 1
Summary of key guideline steps and considerations in Figure 2.

Guideline development roadmap	Priority considerations highlighted by guideline experts when reflecting on the AFEM guideline methods
Guideline group	Consists of three entities: i) end-user and stakeholders (such as guideline decision makers); ii) expert panel; and iii) working group responsible for evidence synthesis. Working group together with the guideline methodologist support the expert panel with guideline processes.
Needs and contextual analysis	Map and describe the clinical context, considering: <ul style="list-style-type: none"> Local resources and gaps End-user needs and expectations
Priority setting, scope and question generation	Seek multi-stakeholder input for priority setting of questions and linked outcomes (including end-users and policy makers) Keep scope balanced and manageable Generate a patient pathway to support question generation (e.g. logic framework to place questions in the patient journey)
Summarising and matching best evidence with questions	Systematically search, match and appraise best available evidence. Depending on time/resources, best evidence includes: <ul style="list-style-type: none"> High quality, up-to-date CPGs Systematic reviews Evidence databases Context-specific (local) policy and CPGs (2nd generation evidence)
Drafting recommendations for guideline panel consideration and input	For questions with matched CPGs with EtD: <ul style="list-style-type: none"> Reassess EtD judgements (adoption) For questions with matched CPGs with no EtD but with systematic reviews with Summary of Findings tables: <ul style="list-style-type: none"> Develop EtD (adoption) For questions with matched CPGs with no EtD and systematic reviews with no Summary of Findings tables: <ul style="list-style-type: none"> Adopt, contextualise or adapt recommendations For priority questions with no matched CPGs or systematic reviews, consider a streamlined <i>de novo</i> approach: <ul style="list-style-type: none"> Focused questions and evidence search One reviewer screening and extraction GRADE and EtD Draft recommendations for expert panel to consider Input of local evidence to maximise implementation efforts is considered at this stage Ensure transparent, documented decisions for each recommendation
Publishing CPG	Seek formal endorsement by local health and service delivery authorities and organisations. Part of end-user and stakeholder panel input
End-user product	Ideally developed in conjunction with guideline implementers, stakeholders (decision makers and end-users) and the guideline group, ensuring the end-user product is: <ul style="list-style-type: none"> End-user driven and tested Based on parent CPG recommendations Draws from existing end-user documents and local CPGs, guidance document and SOPs
Guideline development roadmap	Priority considerations highlighted by guideline experts when reflecting on the AFEM guideline methods
Standard operating procedures and regulations	Separate and independent output produced by policy makers, health services and regulators, and informs the end-user product
CPG and end-user dissemination and implementation	Responsibility of service delivery stakeholders Use local champions to support efforts Ensure regular and consistent communication Consider local end-user needs and expectations

target health care facility or service provider, each recommendation is either adopted or adapted with reasons, considering the facility/user setting.

Expanding alternative guideline development methods: balancing rigour with pragmatism

Experts commented that the AFEM prehospital CPGs produced in 2016 provided a ‘balance of rigour with practicality, an impressive task, given the scope of prehospital guidance and a final CPG that includes over a 1000 recommendations’ [Expert 1]. The AFEM adopt, contextualise or adapt approach provided a flexible, pragmatic and cost-effective manner to develop CPGs, of which the ‘clinical evidence-based part of the CPG seemed to be well received’ [Expert 6]. In reviewing the AFEM methods, experts described and highlighted key approaches to strengthen development and downstream implementation. We incorporated these suggestions into an updated roadmap for future guideline development in resource-limited settings (see Fig. 2), considering the original AFEM methods and challenges described previously [21,28], and drawing from the themes presented in this paper, including Fig. 1. The previous roadmap focused on the process of adapting, contextualising and adapting recommendations and lacked further alternative development options [21].

In conjunction with the guideline development roadmap (Fig. 2), Table 1 describes priority considerations highlighted by guideline experts when reflecting on the AFEM guideline methods. The roadmap (Fig. 2) and considerations presented in Table 1 should be read in together, and aim to improve and update existing AFEM CPG development methods and support guideline development initiatives in low-resource settings, especially professional societies in prehospital care.

The hybrid alternative guideline development roadmap proposed in Fig. 2 draws from the strengths of both alternative and *de novo* guideline development methods and is further expanded in Table 1. In recent years, alternative guideline development frameworks have evolved from a focus on identifying source CPGs for adaptation to adapting specific recommendations to examining the evidence underpinning the adapted recommendations [30]. Our approach allows for flexibility regarding where and when the evidence synthesis steps occur, depending on the depth of reporting and quality of recommendations from the seed CPGs. For example, if recommendations have linked EtD summaries or systematic review Summary of Findings tables, then adoption should be considered [30], which re-examines the evidence underpinning recommendations. If no evidence summaries are available, or when there are multiple recommendations for the same question, the Adopt, Contextualise and Adapt approach, which grades recommendations across CPGs, is a viable option [15] since the underpinning evidence is not readily available. Guideline groups can decide in advance which approach would best work for them, considering the available seed CPGs and their methodological expertise, scope, timeline and fiscal resources.

This updated framework for alternative guideline development for low-resource settings still needs to be evaluated independently, specifically in LMICs, where the needs for adaptive guideline methods is greatest. Our research has a key limitation: we did not conduct in-depth interviews with the experts, which may have provided richer data to expand on complex problems and methods mentioned by experts.

Conclusion

In order to create CPGs that healthcare professionals or healthcare workers trust and use on a daily basis to change lives, guideline developers need rigorous yet pragmatic approaches that are responsive to end-user needs. Reflecting on the AFEM prehospital guideline development project in 2016, we present, in this paper, key guiding themes to strengthen guideline development in LMICs and other low-resource settings. Furthermore, we present three distinct guideline development approaches used in SSA and summarise their approaches. For future

guideline projects in LMICs and other low-resource settings, especially for professional societies in prehospital care, we propose an updated alternative guideline development roadmap.

Dissemination of results

The results of this research will be shared *via* targeted knowledge translation activities including on social media platforms, conference presentations and directly with guideline decision makers.

Funding

This project was funded by the Harry Crossley Foundation, Faculty of Medicine and Health Sciences, Stellenbosch University and the Early Career Academic Development program.

Declaration of competing interest

MM was involved as a guideline methodologist and evidence reviewer in the original AFEM CPG commissioned via the Health Professions Council of South Africa Professional Board of Emergency Care. TY was involved as a consultant. Neither AFEM nor the Health Professions Council of South Africa Professional Board of Emergency Care were involved with the interpretation or final write up of this manuscript. MM is an editor of the African Journal of Emergency Medicine. MM was not involved in the editorial workflow for this manuscript. The African Journal of Emergency Medicine applies a double blinded process for all manuscript peer reviews. All authors contributed to writing the manuscript, approved the final version and met the International Committee of Medical Journal Editors criteria for authorship.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.afjem.2020.09.010>.

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Clinical practice guideline adaptation methods in resource-constrained settings: four case studies from South Africa

Michael McCaul,¹ Dawn Ernstzen,² Henk Temmingh,³ Beverly Draper,⁴ Michelle Galloway,⁵ Tamara Kredon⁵

10.1136/bmjebm-2019-111192

For numbered affiliations see end of article.

Correspondence to: **Michael McCaul**, Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, Stellenbosch, Western Cape 7602, South Africa; mmccaul@sun.ac.za

ABSTRACT

Developing a clinical practice guideline (CPG) is expensive and time-consuming and therefore often unrealistic in settings with limited funding or resources. Although CPGs form the cornerstone of providing synthesised, systematic, evidence-based guidance to patients, healthcare practitioners and managers, there is no added benefit in developing new CPGs when there are accessible, good-quality, up-to-date CPGs available that can be adapted to fit local needs. Different approaches to CPG development have been proposed, including adopting, adapting or contextualising existing high-quality CPGs to make recommendations relevant to local contexts. These approaches are attractive where technical and financial resources are limited and high-quality guidance already exists. However, few examples exist to showcase such alternative approaches to CPG development. The South African Guidelines Excellence project held a workshop in 2017 to provide an opportunity for dialogue regarding different approaches to guideline development with key examples and case studies from the South African setting. Four CPGs represented the topics: mental health, health promotion, chronic musculoskeletal pain and prehospital emergency care. Each CPG used a different approach, however, using transparent, reportable methods. They included advisory groups with representation from content experts, CPG users and methodologists. They assessed CPGs and systematic reviews for adopting or adapting. Each team considered local context issues through qualitative research or stakeholder engagement. Lessons learnt include that South Africa needs fit-for-purpose guidelines and that existing appropriate, high-quality guidelines must be taken into account. Approaches for adapting guidelines are not clear globally and there are lessons to be learnt from existing descriptions of approaches from South Africa.

Background

Clinical practice guideline (CPG) development tends to be expensive, skills-intensive and time-consuming and therefore often unrealistic in resource-constrained settings. Although CPGs form the cornerstone of providing synthesised, systematic, evidence-based guidance to patients, healthcare practitioners and managers, it

is not good use of time or resources to develop new CPGs when there are accessible, good-quality, up-to-date CPGs available that can be adapted to fit local needs. Furthermore, the higher burden of disease in low-income and middle-income countries also arguably makes the focus on evidence-based guidelines even more urgent, to minimise wastage and ensure the best patient care for optimal cost.^{1,2}

As such, alternative approaches to de novo (new) CPG development have been proposed, some of which either adopt or adapt existing guidelines to local settings,²⁻⁴ some use the Grading of Recommendations Assessment, Development and Evaluation (GRADE), termed adolopment,⁴ while others accelerate certain steps in the guideline development process.⁵ These approaches are attractive where resources are limited and high-quality guidance already exists.^{6,7} These methods provide a key vehicle for formal guideline teams, clinicians and decision makers to produce contextually relevant and robust guidance for their setting. To date, there are limited examples in the literature showcasing alternative CPG development methods and standards for teams in resource-constrained settings, whether in high-income or low-income countries.^{3,8-10} As such, resulting clinical guidance in these settings often varies in quality and applicability.¹⁰

In order to address this gap, we present four purposefully selected case studies from South Africa, displaying different approaches for adapted CPG development. This draws from the South African Guidelines Excellence project, a multi-partner research initiative aimed at supporting the understanding of standards of national CPG development, adaptation, implementation and capacity building.¹¹ We also suggest future considerations and lessons learnt for CPG teams that choose to adapt a guideline.

Case studies

Case study 1: national CPG for the management of people with serious mental illness and co-occurring substance-use disorders in South African psychiatric settings

The South African National Department of Health (NDOH) commissioned the University of Cape Town's Department of Psychiatry to draft a 'policy guide' for managing people with serious mental illness and co-occurring substance-use disorders (dual diagnosis). This CPG's target users were



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To cite: McCaul M, Ernstzen D, Temmingh H, et al. *BMJ Evidence-Based Medicine* Epub ahead of print: [please include Day Month Year]. doi:10.1136/bmjebm-2019-111192

mental health practitioners practising in psychiatric settings. The NDOH requested the first draft to be available for stakeholder input within 4 months of project start, with a final version presented at 12 months. The CPG panel included one methodologist and three content experts. In addition, there was a plan for consultation with stakeholders representing psychiatrists, psychologists, social workers, addiction counsellors and service administrators in the field.

The CPG development followed these steps:

1. The team applied the WHO approach for CPG development.¹² They agreed on the outcomes (voted on and discussed a priori by the panel) and used a PICO (Population, Intervention, Comparison and Outcome) framework to formulate health questions.
2. Values and preferences were prespecified and were aimed to minimise cost in the event of small clinical effects.
3. A comprehensive search was conducted in PubMed and the Cochrane Library for CPGs and systematic reviews published in the past 5 years.
4. Available CPGs and systematic reviews were appraised with the Appraisal of Guidelines for Research & Evaluation II (AGREE-II) tool (CPGs) and the (A MeaSurement Tool to Assess systematic Reviews) AMSTAR tool (systematic reviews).^{13 14}
5. Where systematic reviews were available, each health question was reassessed using the GRADE methodology.¹⁵ Re-GRADING was necessary as the systematic reviews differed in their assessment of imprecision where the panel used a clinical threshold approach.¹⁶ Recommendations were based on the GRADE quality of evidence profiles.

There were several challenges. The limited time from inception to first draft did not allow for training of all panel members in GRADE methodology. Consequently, with one methodologist, this meant non-duplicated search and selection, and assessments using the appraisal and GRADE tools. The GRADE process was difficult and time-consuming, necessitating revision of all imprecision ratings from the original systematic reviews due to the guideline panel's use of a clinical threshold method. At times, this required retrospective power analyses. Furthermore, where no systematic reviews were available, existing guidelines were used and needed to be carefully scrutinised, as they often did not use GRADE. The absence of systematic reviews of randomised controlled trials had to be considered in making final recommendations.

The methodologist was also a psychiatrist working in this field, and therefore tensions existed between an advocacy-orientated stance versus an objective stance, necessitating careful reflection to minimise potential bias. Decisions regarding inclusion of systematic reviews and CPGs were based on arbitrary classification into 'high' versus 'low-quality' categories using AMSTAR and AGREE-II, an approach not recommended by the tool developers.

Ethical considerations influenced the formulation of recommendations, as equity plays an important role, where psychiatric patients have been historically marginalised. Quality of evidence as per GRADE, risk:benefit ratios, equity, resource implications, acceptability and feasibility were considered in making recommendations, including all aspects from the GRADE evidence to decision (EtD) framework.¹⁷

Following CPG finalisation, four stakeholder workshops were held to share results and clarify contextual issues. Conveying results of GRADE evidence assessments proved challenging and required substantial preliminary information and teaching to non-research stakeholder audiences. Most often workshop participants wanted simple messages regarding 'what works for dual diagnosis?' and grappled with the nature of options for

treatment. Use of the wording 'weak' to qualify GRADE recommendations based on considerable uncertainty provoked concern from participants, and this led to the adoption of the alternative wording 'conditional', framed as recommendations conditional on enhanced staffing and resources.

Case study 2: 'Health for All', a clinical tool for health promotion in primary care

To minimise the burden of chronic disease, a health promotion approach is required in the delivery of primary healthcare (PHC) in South Africa. A CPG was developed for use by PHC practitioners alongside an adult primary care guideline that is already available.¹⁸ The core aim of the CPG was to enable people to take control over and improve their health and its determinants, through a healthier lifestyle and greater self-efficacy.

CPG development was commissioned by the PHC Directorate of the South African NDOH and led by an independent public health specialist with experience in primary care practice and guideline development. The guideline panel formed included five health professionals, who jointly had experience in primary care, health education, research including evidence synthesis and the development of evidence-based CPGs.

The CPG development followed these steps:

1. Definition of the concept, theories of health promotion and social marketing to guide the process.
2. Conceptualisation of the look and feel of the CPG and how it would be best used in practice in conjunction with adult primary care CPG. This included defining attributes such as language, illustration and relevance to clinical situations. This followed the design of an algorithmic approach that aligned risk assessment and delivery of health promotion alongside clinical assessments of patients.
3. Regular consultation with NDOH and PHC-relevant, condition-specific NDOH programmes, and presentation of drafts at NDOH national and provincial fora to ensure agreement between the developers and NDOH regarding the specific risks and conditions to be included.
4. Population of each selected risk and condition sections of the framework with accurate user-friendly clinical information with active health messages using the PICO framework.
5. This was followed by a hierarchical approach to evidence selection consisting of (1) a search for WHO graded guidelines from 2010, in the absence of which (2) a search of the Cochrane Library from 2010, failing which (3) a search for non-Cochrane, high-quality systematic reviews, or if there was still no evidence (4) a systematic search for evidence by the Cochrane Library (see [figure 1](#)). A training package with

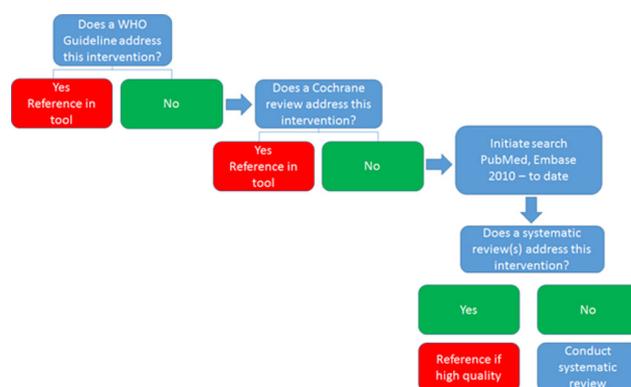


Figure 1 Case 2 search strategy.

a guide and additional tools was designed and piloted by the team in three South African provinces, followed by focus group discussions with users. This provided feedback for the final CPG.

- Finalisation of the CPG which was signed off by the Director General for Health for implementation.

CPG development was completed within 15 months, while endorsement took an additional 18 months. The CPG process, including travel and initial printing, was funded by a non-governmental agency. The national engagement forum was made possible by other sources of non-governmental funding. The NDOH is progressing with dissemination and training for PHC health professionals.

Case study 3: prehospital CPG for South African emergency care providers

South African prehospital emergency care providers have been practising based on protocols that are more than a decade old.¹⁹ Consequently, in August 2015, the Health Professions Council of South Africa Professional Board of Emergency Care awarded a bid to develop the first evidence-based CPG for the South African emergency care profession.²⁰ This CPG was developed under the direction of the African Federation for Emergency Medicine collaborating with other research institutions and emergency care departments. The primary aim was to develop a contextually appropriate evidence-based CPG for prehospital emergency care providers and managers. The CPG needed to be patient-centred and realistic and ensure continuation of care through the emergency system from prehospital to patient discharge.^{21 22}

Due to limitations in time and funding, de novo CPG development was not possible.² Thus, the approach started with engagement with an advisory board of key stakeholders, including methodologists, prehospital providers and various medical specialists, followed by the CPG panel identifying and appraising existing CPGs and using these to develop contextually appropriate evidence-based CPGs.

Key steps in the process included the following:

- Clarifying the clinical questions, followed by searching for existing CPGs.
- We used systematic review methods, including comprehensive searching of the literature, critical appraisal and synthesis.²³
- Full CPGs were critically appraised using the AGREE-II tool.²⁴ The AGREE-II scores were used to assess and prioritise CPGs for use, particularly if there were two or more on similar topics.
- Within priority areas, different recommendations often overlapped; in this case the most current and unambiguous recommendation was accepted.
- High-quality, relevant and up-to-date CPGs were prioritised through consensus by the panel. Where possible, only one guideline per recommendation was used.

Then, the process of adopting, adapting or contextualising existing CPGs for local use was based on an approach used by Dizon *et al* in the Philippines.² Decisions were made by the CPG panel following review by the advisory board. Where applicable, 'practice points' were added; these included more specific guidance to practitioners regarding performance of particular interventions or clarified clinical steps (eg, how to prepare and administer a medicine related to a particular recommendation).

Overall, the steps and processes are similar to those for de novo CPG development. However, the key difference was identifying and synthesising high-quality CPGs for emergency care, instead of use of primary research²² (table 1).

The project was completed within 1 year. The next steps include creating an end-user document (protocol) for use by paramedics, further integration, updating and realignment of prehospital scopes of practice, based on CPG recommendations and planning for CPG updates. The CPG is currently being implemented nationally for South African prehospital care.

Case study 4: a CPG for the management of chronic musculoskeletal pain in South African PHC settings

Globally, and in South Africa, musculoskeletal conditions contribute significantly to the years lived with disability.²⁵ The prevalence of chronic pain is high and there are indications that the prevalence of chronic pain may be higher in developing countries.²⁶

The aim of the CPG was to provide contextually relevant, evidence-informed guidance on the assessment and management of chronic musculoskeletal pain (CMSP), to optimise the health outcomes of patients. Since CMSP is a multidimensional phenomenon, the CPG needed to be holistic and multimodal, to include pharmacological and non-pharmacological interventions. The target users were healthcare practitioners involved with the management of chronic pain in PHC settings.

This CPG was developed through the process of contextualisation of existing high-quality CPGs.³ The CPG panel included methodologists, a diverse group of healthcare practitioners, researchers, educators and healthcare managers. Patient input was sought as part of development, along with broader stakeholder consultation. The process of development took approximately 18 months.

The CPG contextualisation method followed these steps:

- We conducted qualitative research with the aim to develop a framework of local context factors relevant for framing CPG recommendations. The perspectives of patients and healthcare practitioners about the factors influencing pain care were explored.
- A systematic review was conducted to identify existing CPGs on the topic. The included CPGs were appraised using AGREE-II.^{12 27} Only CPGs with high-quality methodology were included.
- Clinical recommendations were extracted from the CPGs and synthesised using a specific writing guide to form a core set of recommendations.
- We used a formal consensus process in which a multidisciplinary team of experts evaluated the proposed recommendations and endorsed them as relevant for the local primary care context.
- The expert group developed specific criteria (context and practice points) using the framework of contextual factors that were developed to enhance the implementability of recommendations. The recommendations were aligned with a typical patient journey as extracted from the qualitative data.
- An external review of the recommendations and proposed clinical pathway was done by additional stakeholders to evaluate the acceptability of the recommendations for the intended setting.
- An end-user document with an implementation plan is currently being developed.

The advantage of the contextualising method is the integration of multiple stakeholder perspectives and the consideration of local context factors. However, CPG contextualisation is dependent on the availability of good-quality and up-to-date existing CPGs.

Table 1 De novo versus case 3 alternative guideline development approach

De novo approach	African Federation for Emergency Medicine alternative approach
1. Organisation, budget, planning and training.	*
2. Priority setting.	*
3. Guideline group membership.	Include advisory board (clinical and methodological).
4. Establish guideline group processes.	Include decision framework for using existing guidelines and recommendations.
5. Identify target audience and topic selection.	*
6. Consumer and stakeholder involvement.	*
7. Conflicts of interest.	*
8. Question generation.	Create broader questions that are transferable to key priority areas applicable and likely to be reported in guidelines.
9. Considering importance of outcomes and interventions, values, preferences and utilities.	*
10. Deciding what evidence to include and searching for evidence.	Clearly defining inclusion of high-quality, up-to-date guidelines and perform comprehensive searches including guideline clearinghouses, Google and traditional databases.
11. Summarising evidence and considering additional information.	Mapping evidence and/or guidelines by priority areas and/or questions.
12. Judging quality, strength or certainty of a body of evidence.	Using Appraisal of Guidelines for Research & Evaluation II appraisal for guidelines and ranking included guidelines by date, relevance and overall quality.
13. Developing recommendations and determining their strength.	Adopting, adapting or contextualising guidelines. Extract recommendations relevant to priority areas and questions. Reviewing adopted, adapted or contextualised recommendations with advisory boards.
14. Wording of recommendations and of considerations about implementation, feasibility and equity.	Reporting original wording of recommendations, levels of evidence and/or strength in plain language. Considering implementation points and practice points for each recommendation that has been adopted or contextualised.
15. Reporting and peer review.	*
16. Dissemination and implementation.	*
17. Evaluation and use.	*
18. Updating.	*

*Indicates processes that are the same or implicit in both pathways.

Lessons learnt: challenges and opportunities

Across the case studies, access to funding and dedicated human resources were a significant challenge, and infrastructure, agreed standards and technical staff to support processes were lacking. Support often came from academics or public health specialists responding to a particular request, additional to their regular working hours. Furthermore, additional training was required for most involved in the CPG development process, with a focus on using GRADE and critical appraisal with the AGREE-II tool. Various opportunities exist, such as providing appropriate training for existing and up-and-coming CPG developers in de novo and alternative development methods and providing appropriate resources, such as a toolkit to guide development for novice and experienced CPG developers.²⁸ Training and capacity building would be most useful, where the need is greatest, for example in ministry technical teams, professional societies and university departments, where CPG quality is often lacking when compared with international groups or national bodies such as the National Institute for Health and Care Excellence (NICE) and Scottish Intercollegiate Guidelines Network (SIGN).²⁹

Across the four cases studies, recommendations often originated from CPGs developed in high-income settings, and significant changes were required in order to implement CPGs in a resource-constrained setting. Research in generating tiered recommendations, based on available resources, for example in high-resource versus low-resource settings, is a potential opportunity

that can assist where methods for how to contextualise recommendations are still unclear and variable.

In summary, key learnings revolved around navigating funding and human resource challenges, whereas opportunities include addressing guideline training gaps and investing in strengthening adaptation and contextualisation of guideline recommendations through stakeholder engagement for efficient guideline development and enhanced uptake.

Discussion

CPG development teams in resource-constrained settings often work with significant technology, human resource and budget restrictions, and therefore de novo CPG development is not always feasible or efficient. Adapted CPG methods therefore may bypass de novo methods, by efficiently using existing high-quality evidence and streamlining CPG development steps. However, adapted methods must still be rigorous, transparent and adhere to the same standards as de novo methods. These amendments to standard CPG development methods, by definition, should thus be responsive, considering the needs of the local CPG development team, topic and setting, without compromising rigour and transparency. Unlike de novo methods, adapted methods have less guidance available on development standards such as those published by the Institute of Medicine³⁰ or Guidelines International Network.³¹ With the anticipated steady increase in CPGs that use alternative methods, developing quality checklists and

adapted CPG standards warrants attention, especially since AGREE-II, the go-to appraisal tool, does not address alternative CPG development issues.

In our experience, alternative development methods should aim to create fit-for-purpose CPGs that consider local contexts with a focus on strengthening CPG implementation and uptake. Such fit-for-purpose CPGs, as we have shown, can be moulded to the unique needs of the setting without compromising on rigour. Even though there was significant variation in methods between the cases presented, all CPGs included important aspects of standard CPG development, from priority setting, comprehensive searches and quality appraisal, to stakeholder input. However, approaches in developing guidance varied across the cases; some used the GRADE EtD or the adopt-adapt-contextualise model in generating recommendations, whereas others focused on implementation through making contextual recommendations or a user-friendly end-user product. We found that case studies provide a useful platform to display and contrast emerging methods in guideline development approaches and offered a valuable approach for reflecting on learning.

Conclusion

CPG development should be a rigorous, transparent and inclusive process, which is contextualised to the needs of the setting. Approaches for adapting CPGs are not clear globally, and often include a mix of pragmatism and rigour. There is a growing group of experts in poorer countries who are gaining experience in adapting CPGs for local needs. There are lessons to be learnt from approaches used in South Africa.

Author affiliations

¹Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, Cape Town, Western Cape, South Africa

²Division of Physiotherapy, Department of Health and Rehabilitation Sciences, Stellenbosch University, Cape Town, Western Cape, South Africa

³Department of Psychiatry and Mental Health, Faculty of Medicine, University of Cape Town, Cape Town, Western Cape, South Africa

⁴Private consultant in public health on contract to South African National Department of Health, Cape Town, Western Cape, South Africa

⁵Cochrane South Africa, South African Medical Research Council, Cape Town, Western Cape, South Africa

Contributors MM and TK drafted the manuscript. MM, DE, HT and BD contributed to the case studies. Case study 1: HT was part of the guideline panel and the guideline methodologist. Case study 2: BD led the guideline development team and actively participated in the design, content and research for the evidence base. Case study 3: MM was part of the core guideline panel and guideline methodologist. Case study 4: DE was the principal investigator. All authors reviewed and approved the final version of this manuscript.

Funding Project SAGE is the result of funding provided by the South African Medical Research Council (SAMRC) in terms of the SAMRC's Flagships Awards Project SAMRC-RFA-IFSP-01-2013/SAGE.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Ethical approval was not required for this paper or individual case studies in the manuscript. The methods reported are all part of public record as part of the guidelines that were developed.

Provenance and peer review Not commissioned; externally peer reviewed.

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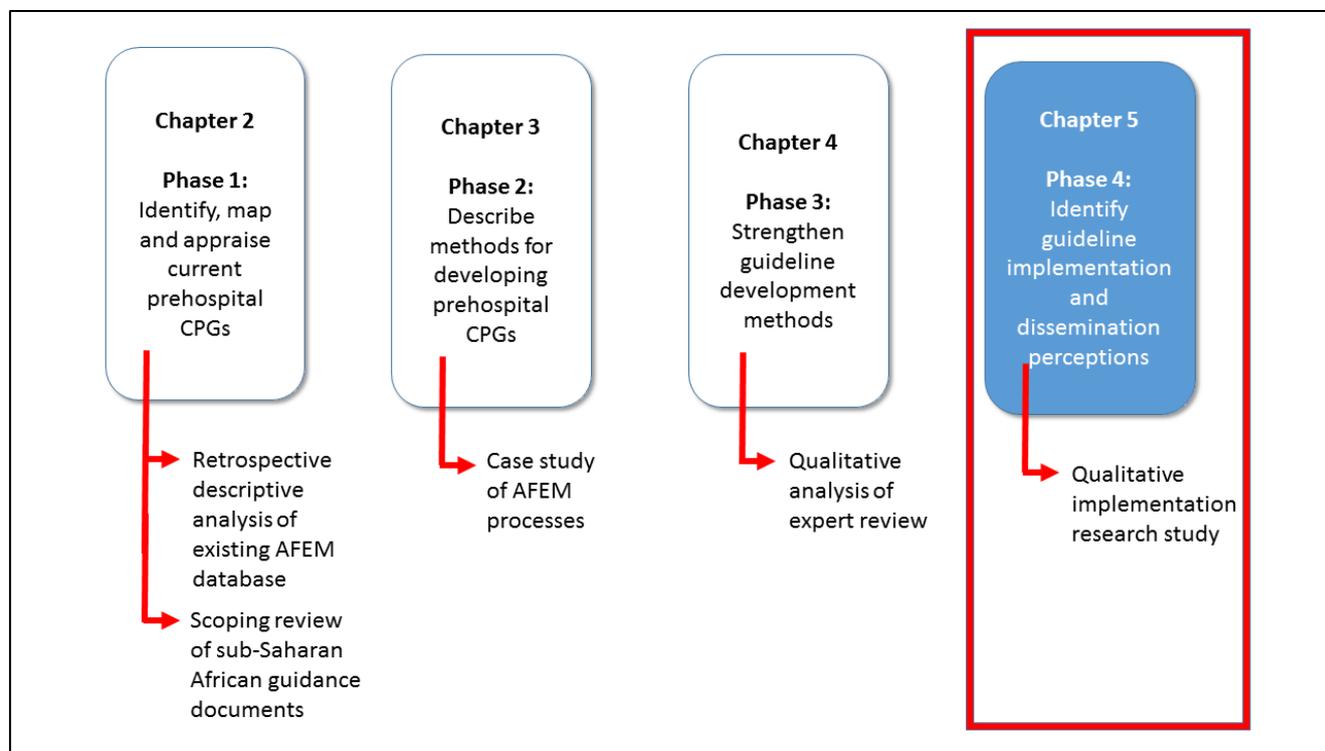
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Chapter 5: Identify guideline implementation and dissemination perceptions

Qualitative Implementation research



Summary, publications and linked presentation

In this last phase I conducted a qualitative study, including focus groups with operational emergency care providers across four major provinces in South Africa. The study aimed to identify prehospital end-users' perceptions of the emergency care guidelines, including barriers and facilitators for national decision makers, to strengthen CPG uptake in South Africa.

Data were analysed using thematic analysis in ATLAS.ti. This included: i) familiarising myself with the data; ii) generating initial codes; and iii) searching for and reviewing themes. Transcripts were coded through line-by-line reading. These codes were then categorised into potential themes related to the study objectives and guided by the interview schedule across the entire dataset, gathering all data relevant to each potential theme. I reviewed themes and codes by generating a thematic map of the analysis. Ethics approval was provided by Stellenbosch University.

Nine focus groups were conducted, totalling 56 participants. Major themes included when and how providers heard about the guidelines, guideline expectations and reactions, and challenges and facilitators of CPG dissemination and implementation. Challenges to dissemination and implementation included poor communication, changes to scope of practice, and limited capacity to upskill existing providers. Facilitators included using technology for end-user documents, local champions to support change, establishing online and modular training, and implementation by independent decision makers. Many of the issues and themes raised by the paramedics were system and policy related in nature, as opposed to guideline implementation issues. In future research, a clear distinction and line of enquiry should be made between guideline implementation issues and health or policy level issues to further facilitate successful guideline uptake and impact.

This study provides an overview of the perceptions of operational emergency care providers and how their experiences of hearing about and engaging with the guidelines, in their industry, can contribute

to the dissemination, implementation and uptake of emergency care guidelines. In order to disseminate and implement an emergency care CPG, decision makers must take into account the perceptions, barriers, and facilitators of end-users.

PUBLICATIONS

McCaul M, Hendricks L, Raveen N. Prehospital providers' perspectives for clinical practice guideline implementation and dissemination : Strengthening guideline uptake in South Africa. *PLoS One*. 2019;14(7):1-14. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0219761>.

PLoS One (<https://journals.plos.org/plosone/>), Impact Factor: 2.776, h-index: 268. Open Access.

Author contributions: MM conceptualised the research idea, collected data, performed the analysis and wrote the first draft of the manuscript. LH supported the write up, data collection and analysis, provided qualitative oversight, and contributed to the write up on the manuscript. RN supported the project from conception to final write up, including interview schedule input. All authors contributed to writing the manuscript, approved the final version and met the ICMJE criteria for authorship.

LINKED PRESENTATIONS

McCaul M, Hendricks L, Naidoo R. Prehospital providers' perspectives for clinical practice guideline implementation and dissemination: Strengthening guideline uptake in South Africa. G-I-N 2018, Manchester, UK. (Poster presentation)

McCaul M, Hendricks L, Naidoo R. Prehospital providers' perspectives for clinical practice guideline implementation and dissemination: Strengthening guideline uptake in South Africa. Stellenbosch University Academic Year Day. 2018. (Poster)

McCaul M. Keynote Talk. 'All breakthrough, no follow through', Evidence implementation in the post-truth world. UCT & SU Emergency Medicine Research Day. August 2018, Cape Town. **(Keynote)**

McCaul M, Hendricks L, Naidoo R. Prehospital providers' perspectives for Clinical Practice Guideline implementation and dissemination: Strengthening guidelines uptake in South Africa. 6th EMSSA International Conference. 1-5 October 2017. Sun City, South Africa. (Oral presentation)

McCaul M, Bruijns S, Brysiewicz P. Knowledge translation in Emergency Medicine. 6th EMSSA International Conference. 1-5 October 2017. Sun City, South Africa. (Panel discussion)

APPENDICES

Appendix 5.1 Social media engagement and knowledge translation output

Appendix 5.1.1 Twitter

Appendix 5.1.2 Policy briefs

Appendix 5.1.3 Online research summaries

Appendix 5.1.4 Knowledge translation video

Appendix 5.2 Conference poster

Appendix 5.3 Blog posts

Appendix 5.4 National Newsletters

RESEARCH ARTICLE

Prehospital providers' perspectives for clinical practice guideline implementation and dissemination: Strengthening guideline uptake in South Africa

Michael McCaul^{1*}, Lynn Hendricks¹, Raveen Naidoo²

1 Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Stellenbosch University, Cape Town, South Africa, **2** Director Emergency Medical Services & Disaster Medicine, National Department of Health, Johannesburg, South Africa

* mmccaul@sun.ac.za



OPEN ACCESS

Citation: McCaul M, Hendricks L, Naidoo R (2019) Prehospital providers' perspectives for clinical practice guideline implementation and dissemination: Strengthening guideline uptake in South Africa. *PLoS ONE* 14(7): e0219761. <https://doi.org/10.1371/journal.pone.0219761>

Editor: Lars-Peter Kamolz, Medical University Graz, AUSTRIA

Received: April 27, 2019

Accepted: July 2, 2019

Published: July 22, 2019

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Data Availability Statement: As this study analyses qualitative data and participants did not consent to have their full transcripts made publicly available, data excerpts are available from Stellenbosch University Research Data Repository for researchers who meet the criteria for access (contact via ssimango@sun.ac.za).

Funding: This publication was funded by Stellenbosch University with support from the World Health Organisation Alliance for Health Policy and Systems Research grant.

Abstract

Background

In 2016 the first African emergency care clinical practice guideline (CPG) was developed for national uptake in the prehospital sector in South Africa, with implementation starting in 2018. Comprehensive uptake of CPGs post development is not a given, as this requires effective and efficient dissemination and implementation strategies that take into account the perceptions, barriers and facilitators of the local end-users. This study aimed to identify prehospital end-users' perceptions of the emergency care guidelines, including barriers and facilitators for national decision makers, to strengthen CPG uptake in South Africa.

Methods

Our study employed a descriptive qualitative research design, including nine focus groups with 56 operational emergency care providers across four major provinces in South Africa. Data was analysed using thematic analysis in ATLAS.ti. Ethics approval was provided by Stellenbosch University.

Results

Themes related to provider perceptions, expectations and guideline uptake emerging from the data was unofficial and unclear communication, broadening versus limiting guideline expectations, conflicted personal reactions and spreading the word. Challenges to dissemination and implementation included poor communication, changes to scope of practice, and limited capacity to upskill existing providers. Facilitators included using technology for end-user documents, local champions to support change, establishing online and modular training, and implementation by independent decision makers.

Conclusion

This study provides an overview of the perceptions of operational emergency care providers and how their experiences of hearing about and engaging with the guidelines, in their

Competing interests: MM was involved as a guideline methodologist in the original AFEM CPG commissioned via the HPCSA PBEC. Neither AFEM or the HPCSA PBEC was involved with the interpretation or final write-up of the manuscript. This does not alter the authors' adherence to PLOS ONE policies on sharing data and materials.

industry, can contribute to the dissemination, implementation and uptake of emergency care guidelines. In order to disseminate and implement an emergency care CPG, decision makers must take into account the perceptions, barriers, and facilitators of local end-users.

Introduction and context

The Health Professions Council of South Africa: Professional Board of Emergency Care (HPCSA PBEC) guides and regulates the emergency care profession regarding registration, education, training, and professional conduct, as per the Health Professions Act of 1974. To date, emergency care clinical practice has been guided by protocols, documents providing clinical practice instructions, last revised in 2006 and 2009 [1–3]. With unclear and outdated evidence underpinning the protocols, the PBEC initiated the revision of the protocols in August 2015 [4]. The African Federation for Emergency Medicine (AFEM), collaborating with researchers and emergency care specialists, was awarded the bid to revise and reformulate the protocols using best evidence in late 2015.

Adaptive guideline development methods were used, where existing up-to-date high-quality clinical practice guidelines (CPGs) were synthesised, instead of primary evidence, and either adopted, adapted or contextualised to the local setting leading to the production of the first evidence-based clinical practice guideline for the emergency care profession in Africa [5]. The CPG culminated in a document with over 1000 recommendations for South African emergency care clinical practice, aligned to local contextual factors. The CPGs represent a transition from skills-driven (protocolised) practice underpinned by expert opinion, to practice that is informed by the best available evidence. Further details around guideline methods and challenges have been reported elsewhere [6]. Since the first submission of the CPG to the HPCSA PBEC in middle 2016 [7], the CPG has undergone public comment, including input from the National Department of Health (NDoH), higher education institutions, other regulatory bodies, and most importantly the guideline end-users, and has officially been ratified and released for implementation in December 2018 [8].

The CPG has been met with fierce resistance because the guideline recommendations and inferred updated scope of practice for providers has vast implications for emergency care service delivery, training, and by extension, curriculum alignment for a total of seven different qualification registries, affecting approximately 70 000 registered providers [9]. Some implications are considered positive (e.g. access to effective treatments previously unavailable), others are considered negative (e.g. narrowing the scope of practice for some providers); overall however, the new emergency care guidelines have brought change and discourse to prehospital care in South Africa. The South African Emergency Medical Services (EMS) prehospital qualification framework is complex, with prehospital training ranging from three weeks to four years (S1 Table).

The current status quo is a mix of different qualifications ranging from basic life support (BLS) to highly trained practitioners with a variety of skills, knowledge and tools to perform advance emergency care and rescue. The majority of EMS providers have a 4-week (BLS) and 3-month intermediate life support (ILS) qualifications. Currently the 4-week, 9 month and 2 year National Certificate courses have been phased out, the 3-month and 3 year National Diploma courses are being phased out as industry transitions to professionalise emergency care providers away from skills based short course training programs. Considering this, the successful dissemination and implementation of the guidelines have been referred to as the 'biggest challenge yet' facing South African emergency care [5] as emergency care policy, curriculum, approval of new medicines, training of providers and industry responds to change.

Globally, an important intervention for maximising the clinical impact of CPGs is an assessment of local barriers and perceptions of the target users [10], for which evidence is currently lacking for prehospital care in resource-constrained settings [11,12]. Decision makers, including industry service providers, the National Department of Health, regulators, and training institutions, need to be aware of the perceptions, experiences, challenges and solutions expressed by prehospital providers for guideline implementation and dissemination to strengthen guideline uptake and have lasting impact on patient outcomes. In order to strengthen guideline implementation, we sought to understand prehospital providers' experiences with guidelines and identify challenges and solutions to guideline implementation and dissemination.

Methods

Our study employed a qualitative descriptive research design. We conducted focus groups with operational emergency care providers across four major provinces in South Africa. The data were thematically analysed, to identify the main perceptions and experiences of individuals or groups of individuals at a particular point in time [7,13–15]. Participants provided written informed consent. The research was approved by the Stellenbosch University Research Ethics Committee (N17/02/018).

Context

It is important that the below findings and processes are read within the temporal context of the study. Focus groups were conducted in early 2017 during which the CPGs had already been submitted to the PBEC (mid-2016). The pre-release communication from the PBEC to providers was on March 2016 [16], reporting on the progress and scope of practice review process, followed by an unintended leak of the CPGs. The PBEC then formally released a draft version of the CPGs to prehospital providers and educators for comment in October 2016 for initial comment, for implementation by education providers in June 2017 [17] followed by the official ratified version and communication for implementation in December 2018 [18].

Participants

The research was conducted across four major provinces in South Africa, namely the Western Cape, Gauteng, Eastern Cape and Kwa-Zulu Natal, representing the heterogeneous nature of the prehospital workforce distribution. Purposive snowball sampling was used to include 56 operational prehospital providers across the provinces. We purposefully invited more public providers than privately employed providers to consider the South African EMS workforce distribution. An equal mix of urban (providers working exclusively in minor city areas) versus rural providers was sought. During the invitation period, we identified potential participants by contacting prehospital societies, local colleges, universities, and employers. Participants needed to have an active registration with the HPCSA to be eligible. Potential participants were contacted telephonically, introduced to the study and study team and invited to participate in a focus group. They were asked to suggest a colleague to invite to the study that purposefully fit the intended distribution of qualifications and geographic settings (urban vs rural). Focus group participation was confirmed via email, detailing focus group venue and time, informed consent, and study details that was discussed telephonically. They were informed that the study was not being conducted on behalf of the HPCSA nor the National Department of Health (NDoH) but as an independent research project from Stellenbosch University, as the investigators were concerned about potential animosity any participants might display towards certain stakeholders.

Data collection

Focus groups were held in boardroom or classroom settings across provinces at local universities or colleges in mid-2017. Only the participants and researchers (MM and LH) were present during focus groups. Each province (except for KwaZulu-Natal) had two focus groups, for private and public providers separately. Investigators conducted three focus groups (two public, one private) in KwaZulu-Natal as in the public sector there was a larger advanced life support interest (BTech/BSc, ECT, CCA and NDip) on the day compared to providers with junior qualifications (AEA and BAA) ([S1 Table](#)). At focus groups an informal conversational atmosphere was promoted by seating chairs in a circular arrangement to facilitate informal discussion, talking to participants as they arrived and sharing refreshments while getting to know one another. Providers were asked to provide written informed consent, followed by a didactic informal presentation by the investigators describing the project details (research team, objectives, project background and process), history and process of the CPGs to date, followed by a question and answer session. MM, a male ECP and the principal investigator, lead the focus groups, and was supported by LH, a female qualitative research consultant. Focus groups lasted approximately 2–3 hours with an average size of seven participants per focus group.

Data collection instruments

All authors were involved in the design of the focus group interview schedule and the schedule was reviewed by representatives from NDoH and the HPCSA PBEC to facilitate knowledge translation of results into policy and practice. The interview schedule was divided into three sections: guideline perceptions and expectations, guideline dissemination, and implementation. Questions such as ‘When you received the guidelines for the first time, what did you expect to see?’ and ‘What are your thoughts on how you think the guidelines can be implemented?’. Focus groups were recorded and transcribed verbatim by an independent contractor. A summary of the findings, as an infographic, was provided to all participants via email for comment and to date no comments have been received.

Data analysis

The data was analysed through a thematic analysis, using the phases described by Braun and Clarke [15]. These include i) familiarising oneself with the data ii) generating initial codes iii) searching for and reviewing themes. Two researchers (MM and LH) coded 7 transcripts through line-by-line reading with the aid of Atlas.ti v7 initial codes. These codes were then categorised into potential themes related to the study objectives and guided by the interview schedule across the entire dataset, gathering all data relevant to each potential theme. We reviewed themes and codes by generating a thematic map of the analysis. The project team met regularly to clarify and define emerging themes.

Reflexivity

Throughout the stages of the study, we attempted to adhere to the methodological principle of reflexivity [19]. This involved all researchers being aware of, and critically examining, their positioning and assumptions. Various steps were also taken to minimise how these might inappropriately influence the research process and outcomes.

The principle investigator (MM) is an emergency care practitioner (paramedic) and was involved in developing the original EMS CPGs for the HPCSA PBEC as a methodologist in the AFEM core guideline panel. MM was an operational paramedic for approximately 4 years in the private EMS sector before becoming a researcher at Stellenbosch University. In proposal

development and data analysis MM drew from operational experience and knowledge of the South African EMS systems to strengthen the contextual framework of the study results. Having previously been an operational paramedic, MM was able to bridge the perceived hierarchy gap between researchers and paramedics during focus group discussions, especially within the private sector but less so in the public sector. As a methodologist and guideline panel member for the AFEM CPGs, MM acknowledged his bias in favour of the guidelines. He objectively distanced himself from influencing conversation (directly or indirectly), perceived misperceptions, and commentary around the guideline development during focus group interviews by handing over to the qualitative researcher (LH) during the focus group discussion. During coding, analysis, and report writing, MM worked together with LH to reflect on participants' insights in the context of the current guideline context. MM drew on his operational experience as a paramedic and LH drew on her experiences as a qualitative researcher to understand each individual provider's context. RN used his experience as a decision maker to provide insight into understanding the implementation and dissemination challenges within the emergency care system.

Trustworthiness

In this study the authors sought to ensure that the research process was trustworthy, so that the findings could be considered a credible reflection of reality [19]. Several measures were taken to establish credibility, dependability, confirmability and transferability, where possible. These included peer scrutiny of the project and data, description of study context, debriefing sessions, iterative questioning, purposeful sampling, rich use of quotations from participants and admission of research beliefs and assumptions.

Findings

56 people participated in the study, across 7 focus groups, the majority of whom were male, with a relatively equal balance regarding location. Participants came from a number of different organisations, with varied levels of operational experience and educational background. Characteristics of included participants can be seen in [Table 1](#).

During focus groups, participants were already exposed to the CPGs. The below themes emerged from the data in response to questions around how they first heard about the guidelines, their expectations of the guideline and challenges and solutions to guideline implementation and dissemination. Themes from the data were:

- Unofficial and poor communication
- Broadening versus limiting guideline expectations
- Conflicted personal reactions
- Spreading the word
- Challenges and opportunities for dissemination and implementation

Unofficial and poor communication

We asked participants when and how they first heard about the CPGs. Here responses varied including hearing about the guidelines via informal channels, receiving documents across social media, and word of mouth; while some providers were unaware of any CPGs.

The guidelines was described as an unofficial release, containing an incomplete version of the original CPGs (excluding the methods), a large document with clinical practice recommendations, and a checkbox list of new capabilities and skills for all prehospital providers.

Table 1. Characteristics of focus group participants.

Characteristic	
Age (years), mean (SD)	36 (7.4)
Gender, n (%)	
- Male	44 (79)
- Female	12 (20)
Qualification, n (%)	
- BTech/BSc	13 (23)
- NDip	2 (4)
- ECT	7 (13)
- CCA	10 (18)
- AEA	15 (26)
- BAA	9 (16)
Employer, n (%)	
- Private	19 (34)
- Public	37 (66)
Location, n (%)	
- Urban	32 (57)
- Rural	24 (43)

See [S1 Table](#) for abbreviations.

<https://doi.org/10.1371/journal.pone.0219761.t001>

These documents were disseminated across social media (e.g. Facebook), communication platforms (i.e. WhatsApp), email, or word of mouth while providers worked shifts:

“It wasn’t anything that came from HPCSA, it wasn’t anything that was sent to us via formal channels. It was literally social media. . .” (CCA, private sector).

“I basically just heard as we were sitting one evening on shift having coffee. . ., but somebody got the document, two hundred and I don’t know how many pages. . ., it’s just bits and pieces of the thing because it’s quite a huge document and the person didn’t read everything” (BAA, private sector).

However, some were not aware of the new CPGs or any decision to review the old protocols.

“To be honest, I think the first time I hear about it, because I’m not a social media person” (BAA, public sector, rural area).

Broadening vs limiting guideline expectations

We asked participants what they expected to see from the new CPGs. These expectations varied between broadening and limiting guideline sub-themes.

Broadening expectations included the expectation of increased scope of practice and training opportunities, to advance clinical freedom, while limiting expectations included autocratic decisions from regulators and a perceived negative agenda.

Providers expected *“to extend our scope of practice”* (BAA, public sector), with redundant skills, practices or pharmacopoeia to be phased out. Providers expected these changes to be accompanied by training opportunities, specifically for providers within the existing EMS by *“incorporating this training for the old guys”* (CCA, public sector).

Providers expected the CPGs to “*broaden the views for us to be able to think out of the box*” (ECT, public sector), expressing the need to move away from the ‘tick box’ approach of allocating scopes of practice and placing providers in hierarchical silos. Some expressed this notion as “*using your own clinical judgment*” (CCA, private sector) or “*introducing an element of choice in terms of decision-making and patient’s best interest. . .*” (ECP, private sector).

However, limiting expectations included concerns that the CPGs “*has potential to drive a certain perceived agenda within the industry*” (CCA, private provider), and concerns around autocratic communication and decision style from regulators:

“The word specifically is bulldozed, that this is going to be bulldozed through and forced down our throats, whether you agree with it or not” (AEA, private sector).

Conflicted personal reactions

Providers reacted variedly to the guidelines, often with conflicting views. Some providers reacted with excitement, some felt their competence and worth as advanced short course paramedics was being questioned, while others mentioned that resource constraints limit providers from retraining at universities.

Some providers were content with the proposed guidelines, specifically the proposed ‘Appendix A’ section “*where 90% of them went first shot*” (ECP, private sector) as very few were concerned with reading the large CPGs document due to the predominant interest in scope of practice changes. Junior providers reacted with excitement to see an increase in their scope of practice while advanced providers were excited to see a focus shift to guidance that is evidence-based with an emphasis on previously neglected clinical topics:

“I was very excited obviously to see the BLS going to get more drugs and ILS get more drugs” (BAA, public sector).

“We’ve got better focus on areas that have been traditionally horribly neglected such as the management of the obstetric patient” (ECP, private sector).

“Everybody’s for it. . . finally it’s actually more evidence-based than what it has ever been” (CAA, private sector).

However, some providers had specific skills removed off their existing scope of practice, like drug facilitated endotracheal intubation (ETI) from CCAs, historically viewed as an exclusive advanced life support skill. Paramedics expressed this as a “*slap in my face*” (CCA, public sector) expressing anger, shock, disappointment, and fear, and felt that the further emphasis on scopes of practice establishes hierarchical silos and division across providers. Paramedics strongly identified with the skill of endotracheal intubation; paramedics see endotracheal intubation as part of their identity and self-worth: “*What is my qualification then actually worth?*” (re removal of ETI, CCA, private sector).

This is a sensitive point for CCAs specifically, as they see themselves as the original advanced life support providers. Advanced short course paramedics feel that their competency as emergency care providers has been questioned; they feel sidelined, abandoned and literally “*scrapped off the register*” (CCA, public sector).

“NDips and CCA’s are the only ones that are actually registered as paramedics with the HPCSA, but now we are not paramedics anymore. . .” (re removal of ETI, CCA, private sector).

Some emergency care providers feel trapped or “*being stuck*” (BAA, private sector) in the current educational framework, especially with the introduction of the new CPGs and scopes of practice. Providers are apprehensive about how they are going to be upskilled and cost.

“Probably all of us need to go to university because it’s too much information and you can’t just start working and using the guidelines” (ECT, public sector).

Providers feel they are left with no choice but to “*resign, go to university for four years and get your degree*” (CCA, public sector) in order to upskill. However, many providers do not have the resources to stop working and go to university.

Spreading the word

We asked participants how they would disseminate the guidelines. Providers expressed ways to strengthen guideline dissemination: i) technology and end-user documents; ii) clear and consistent communication from stakeholders; and iii) using local champions for dissemination and implementation.

Providers referenced online (websites) and mobile technology (apps) as key tools to promote the dissemination of the guidelines as a “*summarised version of those guidelines*” (ECP, private sector). Even among older paramedics, apps seemed an attractive solution and a viable alternative to handbooks. Furthermore, providers advocated for an end-user document as a simpler, condensed “*quick reference guide*” (ILS, private sector), specific to qualifications and highlighting changes, that allows providers to see the continuum of care across all provider levels. Providers suggested the development of the guidelines could be farmed out to various institutions (like colleges or professional societies) and “*using the clinical guidelines that was put together with the evidence, [to] develop a flow process*” (ILS, public sector) and end-user reference book. Furthermore, an advisory committee could be established to independently review the developed end-user documents and whether they aligned to the “*spirit of the original guidelines without being prescriptive*” (ECP, private sector).

Communication was seen as a key factor in repairing the broken relationship between industry and regulators and higher education institutions:

“Communicating with us would go a long way in repairing the relationship” (CCA, private sector).

“You want these protocols in place, it’s fine. You come down here, sit and talk to me about it” (CCA, private sector).

Providers want a clear plan communicated to them, detailing the why, the when and the how. Providers highlighted various other suggestions for communication, stratified into existing and new methods in [Table 2](#).

“Through colleges, through universities, through even small group stations at the base levels. . . so it has to be introduced in a way where the guys accept it” (ECT, private sector).

“Through clear directive communication and a strategy part and parcel with educators and senior members in industry who would eventually. . . filter that information via to ALS to take it down into the industry” (ECP, public sector).

Furthermore, providers want to be involved; they understand they also have to take responsibility for helping to disseminate and implement the guidelines:

Table 2. Suggestions from providers: Guideline dissemination methods.

Existing methods	New (additional) methods
<ul style="list-style-type: none"> • Subscription emails • Standard postbox mail • Webpage • Newsletters • Roadshows/CPD 	<ul style="list-style-type: none"> • Social media (Twitter, Facebook and YouTube) • Forums • Television and radio • Podcasts • Workshops

Providers emphasised using local champions (shift leaders, respected industry practitioners, colleges, and universities) to disseminate guideline information, build capacity and strengthen the uptake of the guidelines through leading the conversation at the coal-face level:

<https://doi.org/10.1371/journal.pone.0219761.t002>

“Let us help and let’s get a finger in the pie and do something” (ILS, private sector).

Challenges and opportunities in dissemination

We asked participants what their anticipated challenges with guideline dissemination would be. Key perceived challenges included the lack of and authoritarian style of communication from EMS decision makers (specifically regulators), unintended dissemination of the guidelines to EMS, and the unexpected and large guideline document received by EMS.

The lack of consistent and clear communication from regulators regarding the guidelines, career pathways, and up-skilling has left providers confused, like *“being left in the dark”* (ILS, public sector). *“We don’t really understand, they don’t explain to us why they’re changing it. They’re just saying: ‘It’s changed, here’s the evidence’”* (ECT, private sector).

This effect was noted by rural paramedics, where providers felt *“cut off about the big things that are happening in EMS”* (BAA, public sector) and felt left out due to centralisation of information and Continuous Professional Development (CPD) activities often being restricted to urban areas.

Furthermore, as the guidelines were unintentionally disseminated (leaked) to providers, a fractured message was received and caused confusion among paramedics. From that point onwards providers felt communication from regulators was a *“one-way stream of information”* (NDip, public sector) with *“no regard to what we on the ground. . . our feelings are or our sentiments are”* (CCA, public sector). Providers expressed a significant need to be involved in the decision-making process and to have a platform to express views (and receive feedback) so that they could understand why changes were made.

Additionally, providers did not expect to receive such a large guideline document and wanted a streamlined protocol with algorithms:

“. . . a barrier would be how big the books are, three hundred pages, I’ll be honest with you, I’m not going to read that three hundred pages in depth” (ECP, private sector).

Challenges and opportunity for implementation

We asked participants what their anticipated challenges with guideline implementation would be. They expressed various challenges for guideline implementation: i) concerns that current short course training framework provides a poor educational foundation; ii) a lack of enabling upward articulation; iii) fears and apprehension about how providers are going to be up-skilled; and iv) concerns that current emergency care education systems lack capacity and resources to update or train.

Emergency care providers expressed their concern that the current short course training framework provides a poor educational foundation for providers to engage, understand and interpret the new guidelines. Providers indicated their concern that the short course education system is akin to a “*spoeg en plak*” [copy and paste] system where a “*monkey see, monkey do learning. . .*” is implemented and “. . .so their desire to grow and learn and research and figure it out for themselves has been lost” (ECP, private sector). The consequence of this system failure is presented in this private sector ECP’s thoughts below:

“The consequence to that is that they’re not understanding how to interpret the recommendations and the projected guidelines and so they are deferring to what they’ve always known, which is a protocol driven approach, where you will do this or you won’t do that.”

The above observation is reflected in the attitude of short course qualified providers as their primary concern and focus is around scopes of practice and skills:

“Patient care, how to manage the drugs and all. That’s all I want to know” (BAA, public sector).

The guidelines implicated various levels of providers regarding scopes of practice, by increasing scope for most, but also removing some skills from others (i.e. ETI). This created a perceived implementation barrier regarding the current educational system’s capacity to facilitate this required upskill of existing providers, whether through higher education institutions, colleges or employers.

“How on earth are we going to educate forty thousand people on new protocols and be sure that all of them have actually upskilled and updated appropriately?” (NDip, private sector).

Providers expressed concern that the current educational system lacks the capacity and resources to update or retrain the existing qualified prehospital workforce. One public sector CCA indicated he has no capacity to upskill: “*I can’t leave my job and come here for four years and hope to pass something that I’m already skilled at*”, referring to obtaining a degree just to perform intubation again. Some providers attributed the barrier not to lack of capacity but to lack of will to enable upskilling via recognition of prior learning or other streams as presented by this ECP (private sector): “*I think it’s not so much that the varsities can’t cope, I think that there’s a lack of will to do something constructive about it*”.

We asked participants how they would implement the guidelines. Providers expressed ways to strengthen guideline implementation: i) establishing inclusive career pathways; ii) establishing online and module training; iii) using local champions; and iv) implementation by independent makers.

The guidelines have caused considerable uncertainty within the industry and providers are unsure of where they are heading as a profession. Solutions provided are two-fold: clear communication, and providing direction to the profession regarding next steps. Emergency care providers expressed the need to know where they are heading, opportunities for upskilling (or not), implementation details, timeframes and questions answered: “*If you give us a pathway and say: We can up-skill you, we can improve you, you will be fine, you will be okay, I’ll go to work every day with a smile on my face, knowing that I’m going somewhere*” (CCA, public sector).

Providers expressed that stakeholders (specifically the HPCSA PBEC) need to take ownership of the confusion caused, “*taking charge, standing up, saying, ‘Hey guys, the ball was*

dropped, you all got it this way, it wasn't correct" (CCA, private sector), and apologise to the profession. Providers felt that stakeholders have the mandate to enable change and should be taking responsibility for implementing this successfully, starting with a clear communiqué regarding *"how it's going to be run out [implemented]. . ."* (ILS, public sector) and *"what our plans are, this is what we intend to do and these are the time frames"* (CCA, public sector). Providers expressed that they do not understand the changes:

"Why there is such a big difference between the previous to now?" (ECT, public sector).

Providers felt strongly that training local industry champions would strengthen the implementation of the guidelines (gaining buy-in), especially among junior providers who look up to senior providers:

"Let's do it [train] through the ALS, EMS is a small industry and people who have a low qualification look up to the ALS. . . for instance, I want to be like [him] one day" (BAA, private sector).

Providers suggested universities and colleges lead the implementation of the guidelines for new providers entering the education system whereas independent professional societies like *"EMSSA and ECSSA take on some of the training programs that would allow you to increase your scope"* (ECP, public provider). The National Department of Health, together with various stakeholders such as higher education institutions and employers (such as managers) would be involved in making the implementation a success and ensuring buy-in. Additionally, providers advocated for an online modular system, *"something where I don't have to stop working in order to accomplish that. . ."* (BAA, private sector).

"Progression, that is why the modular system is extremely important. . . the outcome is still going to be the same. . . whether I do it modular or whether I spend two years in the university. . ." (CCA, public sector).

Discussion

In this paper we identified a sample of prehospital end-users' experiences and perceptions of the EMS guidelines, including key challenges and recommendations for national decision makers, in order to strengthen guideline uptake in South Africa and similar contexts. Prehospital providers' perceptions of the CPGs for emergency care in South African were largely influenced by the contrast between expectations and the eventual perceived reality of the guidelines. Across the board, providers expected an increase in their scope of practice, most equating a larger scope to better care for patients. Providers were more concerned with the scopes of practice as opposed to the actual guideline recommendations. This was highlighted in some providers' dependence on certain skills for professional affirmation and was especially emphasised when these skills, such as drug-facilitated intubation, were removed from advanced life support (CCA and NDip) paramedics' scope of practice. Providers were shocked and disappointed, feeling their qualification and identity hinges on their ability to perform these skills, irrespective of (or oblivious to) the evidence of harm to patients.

Understandably, these advanced life support providers felt slighted and side-lined as they could no longer perform a skill, which they have been practicing for decades, that higher qualified ECPs can still practice using rapid sequence induction. Furthermore, we think part of the

anger and disappointment expressed by providers can be attributed to the overall poor communication from industry regulators, whom providers already perceive as having a hidden agenda. However, it is still unclear what the repercussions of removing drug-facilitated intubation would be on industry service delivery, especially in the public sector, which predominantly employs CCAs and NDip paramedics.

Furthermore, we identified various solutions, supported by literature, to guide decision makers to promote the uptake of their guidelines specific to prehospital care. These included educational workshops tailored to barriers [20], development of end-user documents based on the parent CPGs [21,22], the use of industry/opinion leaders [23] and implementation by impartial local stakeholders [24]. Unexpected results and novel facilitators include creating and communicating a clear career and study pathway for providers, decision makers taking ownership of failures, using online modular training for existing providers and explaining any changes contrary to the status quo. The majority of identified facilitators revolve around education and communication, highlighting the important role of stakeholders such as emergency care colleges and universities collaborating with professional societies and regulators in strengthening guideline uptake.

As the EMS industry moves from six providers to a three-provider system (ECAs, ECTs and ECPs) [25], clear leadership is essential to transition the profession at this time. The successful dissemination and implementation of the guidelines will require careful alignment of policy and action from stakeholders that considers the perceptions, barriers and facilitators of the local end-users. This is especially relevant for providers trained outside of universities, some of whom are finding it difficult to transition from a skills-based practice (protocol guided) to an evidence-based practice. Prehospital decision makers can draw from existing South African guideline initiatives such as the South African Guideline Excellence (SAGE) group [26] and international resources [27].

As limitations, it is important to note that the results reported in this paper are those of a particular point in time and may well have changed as the guideline dissemination and implementation process continues in South Africa. Moreover, our study does not shed light on decision makers' perspectives or other stakeholders such as prehospital managers, an important subgroup when considering guideline implementation, and one which warrants attention in future research. This study does however highlight, for the first time in South African EMS history, across all EMS qualifications, various prehospital perspectives, attitudes and issues regarding how providers view themselves, the educational system, evidence, and clinical practice. These are integral in understanding the nature of EMS and is useful for decision makers to address prehospital service delivery concerns by being able to navigate the barriers around guideline uptake in South Africa and similar contexts.

Conclusion

In order to disseminate and implement a national emergency care guideline, decision makers should take into account the perceptions, barriers and facilitators of the local end-users. Through synthesising the perceptions of prehospital providers across South Africa, we identified the profession's expectations, its corresponding reactions leading to the challenges, and most importantly, the collective solutions proposed by paramedics.

Decision makers, such as the National Department of Health, the South African Health Professions Council of South Africa and EMS industry leaders are essential consumers of our research and thus require targeted dissemination strategies to effect policy and practice. Further activities linked to this research include disseminating results to key decision makers and formulating feasible recommendations together with the policy makers, to enable action.

Supporting information

S1 Table. EMS qualifications in context.

(DOCX)

S1 Text. Interview guide.

(DOCX)

Acknowledgments

The authors would like to acknowledge Prof Karen Grimmer for her valuable input and insights, as well as the support from Prof Taryn Young, Prof Mike Clarke and Prof Stevan Bruijns. Secondly, the author team would like to thank Mr Benjamin van Nugteren as Chairperson of the Clinical Advisory Committee, Professional Board of Emergency Care HPCSA for supporting the aim of this research. Lastly, we would like to thank all the prehospital providers, from across South Africa, without whom this study would not have been possible.

Author Contributions

Conceptualization: Michael McCaul.

Data curation: Michael McCaul.

Formal analysis: Michael McCaul, Lynn Hendricks.

Funding acquisition: Michael McCaul.

Investigation: Michael McCaul, Raveen Naidoo.

Methodology: Michael McCaul, Lynn Hendricks, Raveen Naidoo.

Project administration: Michael McCaul.

Resources: Michael McCaul.

Validation: Raveen Naidoo.

Writing – original draft: Michael McCaul, Lynn Hendricks, Raveen Naidoo.

Writing – review & editing: Michael McCaul, Lynn Hendricks, Raveen Naidoo.

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Chapter 6: Discussion

A good clinical practice guideline can be compared to a good orator, or public speaker. A good orator is someone who is eloquent and skilled in getting a message across to their intended audience, much like a good guideline. Following this analogy, a clinical practice guideline can be an orator for moving best available evidence into policy and practice, an important and often daunting task. Not all orators are perfect and neither do they get their message across perfectly. The same can be said for guidelines, hence the need to strengthen them and to strengthen the transfer of knowledge from them.

In South Africa and internationally, guideline development across various disciplines requires strengthening. This is particularly so in prehospital care, where evidence is sparse and where the impact of appropriate or inappropriate guidance can be felt across the healthcare sector. The research generated by this PhD (Box 1) was focused on strengthening the development and implementation of CPGs in South African prehospital care and ‘followed through’ with implementation research, moving this evidence into policy and practice, as discussed in Chapter 8.

Box 1: The PhD research contribution

Chapter 2, Phase 1:

Mapped the status of global and sub-Saharan African prehospital guideline availability, quality and characteristics. Identified guideline gaps, strengths and areas for improvement globally. Identified significant factors that influence guideline quality. Provided recommendations for future research to strengthen guideline development for LMICs.

Chapter 3, Phase 2:

Provided a critical reflection of the AFEM guideline methods, describing key challenges and lessons learnt in developing prehospital guidance using alternative methods for future guideline projects.

Identified unique challenges, solutions and short to long term priority actions for both guideline development and implementation for stakeholders to strengthen guideline methods and uptake in the prehospital setting.

Chapter 4, Phase 3:

Described key guideline principles and approaches to strengthen alternative guideline development in LMICs and other low-resource settings. Generated a novel hybrid guideline development roadmap for alternative guideline development in low-resource settings.

Chapter 5, Phase 4:

Described prehospital providers’ perceptions of the AFEM guideline, providing insight for national decision makers to strengthen guideline uptake and implementation.

Identified key challenges, facilitators and recommendations from South African prehospital guideline end-users (paramedics) for stakeholders to navigate the complexities of guideline implementation in the South African emergency medical services.

Summary of thesis findings

The original research conducted as part of the PhD explored the process of developing and implementing a South African prehospital CPG for prehospital providers and identified how this can be strengthened. This PhD was nested within a larger guideline development project, which produced the first clinical practice guideline for South African prehospital providers in 2016.

In order to achieve the overarching PhD aim, various objectives were considered and presented on a chapter-by-chapter basis:

Chapter 2: To describe and spatially map the characteristics and quality of national and international prehospital CPGs produced between 2000 and 2016

This descriptive study used information from a database of international prehospital CPGs to show that prehospital CPGs predominantly originate from high-income countries, that the majority use *de novo* methods, and that CPGs vary significantly in quality. Most CPGs were developed by professional societies, with relatively few developed by international bodies. National bodies produced higher quality guidelines when compared to other guideline producers. CPGs are available for an array of emergency topics including resuscitation, trauma and medical emergencies, and for various age categories. Many focus on adults, with smaller numbers of CPGs available for geriatric populations and neonates. The study showed that people developing new guidelines have an expanding pool of high-quality CPGs that can be used for guideline adaptation, adoption or contextualisation to LMICs settings, but further examples are needed for how this can be achieved, specifically in the prehospital setting where research evidence is scarce.

The scoping review of sub-Saharan African prehospital guidance documents revealed the majority of guidance documents lacked an evidence foundation, made recommendations based on expert input, and were predominantly end-user presentations such as algorithms or protocols. Overall, reporting quality was poor, specifically for critical domains such as rigour of development; however, clarity of presentation was generally strong. Guidance topics were focused around resuscitation and common diseases (both communicable and non-communicable) with major gaps identified across a variety of topics. This study highlighted need to strengthen and build guideline development capacity to promote the transition from eminence-based to evidence-based guidance for prehospital care in SSA.

Chapter 3: To describe the methods of developing a prehospital CPG for guideline development teams in low-resource settings

Firstly, in a critical reflection of the AFEM guideline methods, this research identified and described the key experiences of developing a South African prehospital CPG using alternative methods, and unpacked key lessons learnt and challenges encountered. Key challenges included applicability issues (with few existing prehospital guidelines being applicable to Africa), varied guideline quality, and navigating heterogeneous levels of evidence classifications. Key lessons learnt revolved around searching techniques for finding CPGs, and the benefits of evidence mapping and transparency in knowledge translation.

Secondly, the qualitative case study investigated the AFEM CPG development project conducted in 2016 for prehospital providers. It showed that the process has had a profound impact on clinical practice, as the majority of prehospital providers benefited from expanded access and care options. However, key challenges, specifically around guideline implementation, were highlighted. These included the unavoidable effect of interest and beliefs on implementing recommendations by stakeholders, the national evidence void, a shifting implementation context and opposing end-user needs. Overarching solutions were proposed for these challenges; stated as short-, medium- or long-term priority actions for guideline implementation and development stakeholders in South Africa. From this body of work, key guideline development methods were described, supported by a thorough understanding of challenges for prehospital guideline development and context-specific solutions.

Chapter 4: To strengthen guideline development methods for low-resource settings by drawing from the experience and reflections of international guideline experts

From this qualitative study of international expert reviews of the AFEM guideline development project, key considerations for alternative guideline development themes emerged. The study explored the sufficiency of using CPGs as research evidence, a method prevalent in alternative guideline development. I discussed how using local evidence and enabling wider consultation with

guideline panels can strengthen guideline validity and implementation when other CPGs are considered as the primary evidence base. The study revealed the blurring of responsibilities between guideline development teams and high-level stakeholders (such as regulators) and the importance of creating clear boundaries between clinical and regulatory output. I explored options in reporting heterogeneous levels of evidence classifications in guidelines. Lastly, I presented a snapshot of three fit-for-purpose guideline development approaches and created a novel alternative guideline development roadmap for guideline teams in low-resource settings, balancing rigour with pragmatism. A summary of this roadmap is presented below in Figure 2.

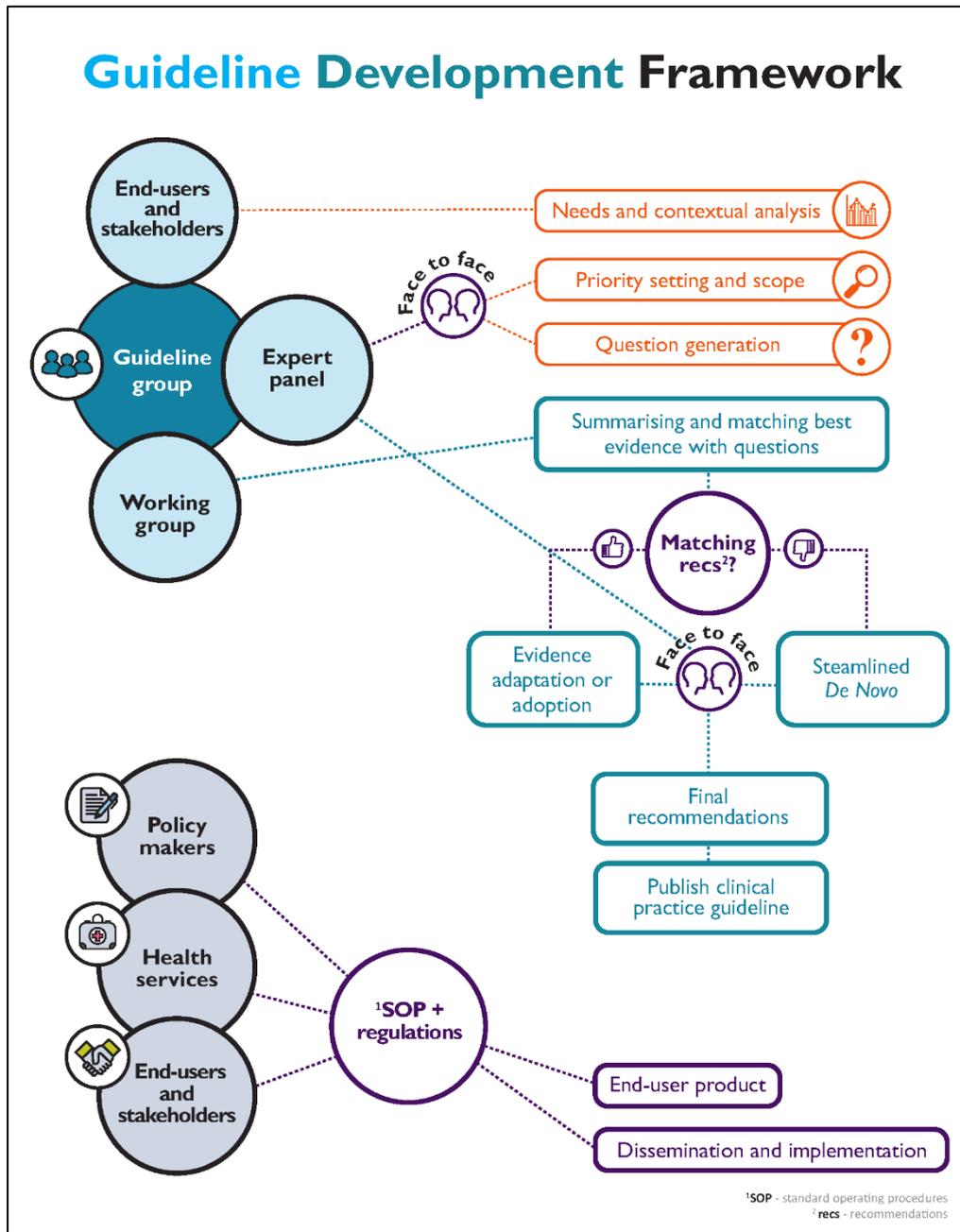


Figure 2: Guideline development roadmap for prehospital care.

Chapter 5: *To strengthen prehospital guideline implementation in South Africa by exploring prehospital providers' perceptions of guideline implementation and dissemination*

Through this qualitative descriptive study, I described the perceptions of prehospital providers of the AFEM CPG in order to inform stakeholders of existing and future guideline implementation and dissemination barriers and facilitators. Barriers to implementation and dissemination included poor communication, unexplained changes to scope of practice, and the prehospital sector's strapped capacity to upskill existing prehospital providers. Themes often blurred the lines between policy/system issues compared to guideline implementation issues. Guideline implementation and dissemination facilitators included using technology such as apps for end-user documents, using local champions to support practice change, establishing online and in-person modular training for prehospital providers and implementing guidelines via independent decision makers. In order to translate these findings to policy-makers and national stakeholders in emergency care, this project used the method of implementation research by involving key national decision makers in the design of the study, aiding the uptake of findings to policy and practice. Chapter 5 drew from the PRISM framework (A Practical, Robust Implementation and Sustainability Model) to inform the research approach¹.

Comparison with findings of previous research

CPGs play an essential role in consolidating and presenting best evidence in an accessible manner to those who need to make healthcare decisions. In prehospital emergency care, providers deal with life-threatening conditions on a daily basis, where a single misstep can be the difference between life and death. Thus, especially in these volatile settings, clear guidance that is accessible, trustworthy, transparent and evidence-based is of utmost importance. Indeed, guideline quality is a proxy measure of guideline trust, and understanding the landscape – including quality of prehospital CPGs both globally, regionally and nationally – is an essential step for strengthening guideline development, implementation and uptake.

My findings on guideline quality – both at an international and regional level – correspond with those of others in different healthcare settings. For example, Machingaidze *et al.* (2017) appraised the quality of selected South African primary care CPGs where rigour of development, editorial independence and applicability had the lowest median scores using AGREE II, which is similar to my Chapter 2 findings². My findings, together with those of others^{3,4}, further emphasise the need for concerted efforts to build the capacity of guideline development teams, especially in professional societies – who, overall, produce the least trustworthy guidelines⁵. Furthermore, capacity building extends to journal editors, who often publish guidelines without enforcing the quality reporting standards set by tools such as the AGREE II reporting checklist⁶ and AGREE REX (for recommendations)⁷, an important step often overlooked in publishing secondary research. To this end, progress has been made through SAGE, which provides an opportunity for training in guideline development methods and developing online guideline toolkits for users and developers of guidelines^{8,9}, and is supported by this thesis.

In regard to understanding the guideline landscape in South Africa, Wilkinson *et al.* (2017) conducted a scoping review of all South African guidelines in the broadest sense, but did not appraise guideline quality¹⁰. They included 257 guidance documents, mostly from professional societies, and identified 13 guidelines related to trauma and emergencies. The majority of these (n=11) from professional societies were posters and algorithms. They note that accessing guidelines was challenging and required extensive searching, an issue that will likely persist in South Africa and Africa widely until there is a central guideline coordinating unit and/or a regional guideline depository such as G-I-N. Considering the findings of Chapter 2 within the larger body of evidence, there is now a much clearer picture of the global, regional (African) and national (South African) guideline landscape to explore and strengthen guideline development methods for prehospital care.

Alternative guideline development methods, like a good orator, shift and change depending on the guideline target audience and setting. In this regard, allied health has successfully applied similar methods of adapting, contextualising and adopting in South African musculoskeletal^{11,12} and stroke care guidelines^{13,14}. These guidelines were well attuned to the local context because the authors sampled patients' and practitioners' perspectives and preferences to inform the recommendation contextualisation process. Siegfried *et al.* (2018) showcased the contextualisation method in development of a toolkit for health promotion in primary healthcare settings in South Africa, where a major strength was a clear engagement with stakeholders such as the NDoH¹⁵. Similarly, in regard to creating third generation (end-user) documents, the PACK 101 approach – where a clinical decision support tool is made from the ground up (drawing from national evidence, policy and guidance) – is an excellent template for creating a user-centric and policy-aligned decision tool^{16,17}. This approach is however dependent on the successful dialog between policy-makers, regulators and the NDoH, a process relatively untested in prehospital care in South Africa. Linked to clinical decision tools, which focus mostly on ensuring guideline uptake in practice, the Guideline Implementability for Decision Excellence Model (GUIDE-M) provides a comprehensive visual map to navigate and prompt guideline developers around key elements in guideline implementation¹⁸. Although not strictly an alternative guideline development method, the streamlined *de novo* approach described in Chapter 4 was successfully used by the Belgian Red Cross to develop an African first aid manual^{19–21}. These types of rapid guideline development approaches, using primary evidence synthesis or an existing evidence database (e.g. BMJ Best Practice)²², together with strong expert input, is another viable option showcased in the literature.

The AFEM prehospital guideline project experienced implementation challenges, beyond those faced for guideline development: specifically, the unavoidable effect of conflict of interest and beliefs (or hidden agendas) when implementing recommendations after the guideline had been developed. This facet is typically outside the mandate of guideline development teams. Although the challenge of conflicts of interest is well described and known^{23–26}, the role of beliefs, interest and conflicts during implementation is still largely unknown. Conflict of interest is typically only considered and addressed during guideline development and when guideline panels promulgate recommendations^{26,27}; however, little thought is given to potential conflicts, beliefs or interests by stakeholders when deciding how to implement or action recommendations. Schunemann *et al.* (2014) describe various conflict of interest considerations, specifically for *de novo* methods, including clear implementation directions for stakeholders. Unfortunately, once the guideline is 'open' for implementation and outside of the systematic and structured developmental process, transparency in decision making for implementation often breaks down, as was seen in the AFEM guideline implementation phase led by the national regulator. As revealed in Chapters 4 and 5, open and wide consultation with stakeholders (users, policy-makers and regulators) during guideline development and implementation is a key element in ensuring successful guideline uptake. Such face-to-face guideline panel meetings should be aimed at reaching consensus, especially for controversial recommendations and how they might be implemented. These should be considered a universal principle of guideline development and implementation efforts. Mapping tools such as GUIDE-M may prove useful in aiding guideline developers and stakeholders navigate the myriad implementation and guideline development considerations¹⁸.

Furthermore, guideline development teams are dependent on the existence of high-quality guidelines when adapting or adopting. This is a significant problem when there is an evidence void, which is the case in the prehospital setting and has been experienced by others²⁸. Indeed, even when existing guidelines are available, the recommendations are not presented in a uniform manner. The increasing uptake of GRADE²⁹ and the Evidence to Decision framework³⁰ should increase adaptation efforts (e.g. adoption)³⁰. Other options, such as reporting plain language evidence summaries or consolidating levels and strength of the body of evidence from heterogeneous classification systems, such as proposed by Grimmer *et al.* (2018)³¹, should also help. In fact, Grimmer *et al.* provide various solutions to existing problems, including i) describing a patient pathway to guide question formulation and priorities; ii) dealing with multiple conflicting wording of recommendations; and iii)

determining an overall strength of body of evidence grading for a composite recommendation from multiple guidelines for one question. These methods, although well described during development of a stroke rehabilitation guideline¹³, likely lack internal consistency, due to the complex and layered decisions that guideline panelists will make in formulating recommendations, where further testing will be needed.

Despite the advances and insights presented in this thesis, the appropriate development, use and acceptance of guidelines is still largely dependent on whether there is capacity and appreciation for evidence-based health care principles and synthesis products such as systematic reviews and guidelines. As Louw *et al.* (2017)³² and SAGE⁹ alluded to, building guideline literacy in South Africa and LMICs is the cornerstone of ensuring uniformity in guideline development, implementation and uptake, and is an initiative that this thesis advocates for in prehospital care (See Box 1 above).

Various prehospital-centric professional societies in South Africa publish protocols and practice guidelines for their members and other clinicians³³⁻³⁵. Although considered third generation (end-user products), each of these should be linked to clear parent guidelines and/or an evidence base. Unfortunately, this is often not the case, casting doubt on the trustworthiness of the recommendations and whether they are evidence-informed. In all likelihood, these protocols and algorithms are based on some form of evidence, but it is unclear whether the evidence is valid, free of selection bias, information bias or conflicts of interest. It is imperative that societies producing widely used guidance clearly report how and where their recommendations were developed.

Excluding the 2016 AFEM prehospital guidelines, prehospital and emergency care guidance in South Africa is still dependent on “GOBSAT” (Good-Old-Boys-Sitting-Around-a-Table), eminence-based guideline development methods, or at best, simply poorly reported methods. This PhD has helped to unpack what guidance is available for prehospital care regionally and globally, how these clinical products can be strengthened and what guideline development in this setting should look like in the future. Strengthening guideline development and implementation for any discipline is a complex and multifaceted task. It will test stakeholder relationships, the systems’ readiness for change and the willingness of guideline developers to reflect on our failures and successes.

Strengths of this PhD project

The research evidence generated in this PhD project contributed to advancing alternative guideline development methods in low-resource settings, using a South African prehospital guideline project as a point of reflection and departure. The vast majority of guidance available to prehospital professionals in sub-Saharan Africa is of poor methodological quality³⁶, a crude yet powerful indicator of the profession’s guideline literacy. This PhD should help in strengthening the status quo of clinical practice guidance for paramedics in the region and in South Africa, a call first made in 2013 and 2014 during the African emergency care consensus conferences^{37,38}. However, the evidence generated from this PhD is not discipline-specific and is applicable to any setting with low resources, whether an LMIC or high-income country.

This PhD project used both quantitative and qualitative research methods to generate new knowledge and evidence. Using both research methods has the advantage of being able to answer various types of research questions, and draws on the strengths of each research paradigm. Additionally, the PhD used secondary research methods, where the unit of analysis is publication data, such as done in a systematic review or scoping review. All sub-projects of this PhD had *a priori* designed protocols and, where applicable, were submitted for ethical approval and conducted in accordance with project protocols.

This PhD signals the first critical reflection and research on the state and methods of prehospital emergency care guideline development in South Africa. Beyond ‘research breakthrough’, the PhD project also ‘followed through’ with a target-specific knowledge translation strategy, be it for academics, policy-makers or paramedics. In this regard, this PhD used implementation science among other methods, involving key stakeholders such as policy-makers early in the design of the

research, in order to facilitate the translation of evidence into practice and policy. This facet of the PhD is described further in Chapter 8.

In mapping the characteristics and quality of global prehospital clinical practice guidance documents, the database of CPGs was updated, but still only included pure CPGs, in line with the original AFEM project's database. This gap was later addressed via a scoping review of sub-Saharan African guidance documents, for which I supervised the research and built local (national) and international student capacity in evidence synthesis from Stellenbosch University and McMaster University students respectively. Furthermore, the original landscape analysis was conducted together with the original AFEM guideline development team, supporting continuity and internal validity of data and output.

The qualitative arms of this PhD were strengthened methodologically by using experienced and independent interview and focus groups facilitators, as in Chapter 4, or conducting focus groups across the country to maximise result applicability and depth as in Chapter 5. Additionally, in interviews with paramedics, focus groups were stratified by private and government-employed providers, acknowledging the inherent resource and need differences between the two cohorts, enriching the depth of the data. Furthermore, having a background as a paramedic and being involved during the AFEM guideline project, I was able to draw from my life experiences and knowledge to strengthen the data analysis and interpretation. Trustworthiness and reflexivity featured through the qualitative components of the PhD and included peer scrutiny of projects and analysis, rich description of study contexts, debriefing sessions, interactive questioning, purposeful sampling, rich use of quotations in text, member checking, and reflections of research beliefs and assumptions. In Chapter 4, purposeful sampling of high-level international guideline experts allowed for qualitative benchmarking, peer-review and input. The data collection was pragmatic, allowing experts to provide written or voice memo data, as locking down leading international researchers for in-depth interviews across varying time-zones is challenging at best.

Research should not just be about breakthrough, but should also include follow through, and hence this PhD project included knowledge translation activities. This included publishing the findings in open access journals, engaging with national policy-makers and regulators, disseminating multiple forms of research reports and summaries (i.e. podcasts, blogs, vlogs, infograms, posters, YouTube videos and handouts), conference presentations and keynote talks, editorials and commentaries, and social media products. Furthermore, by invitation, the PhD findings were presented at a formal NDoH standing committee meeting and incorporated by the independent task team appointed by the HPCSA PBEC to advise the NDoH and HPCSA around guideline implementation approaches for prehospital care. This PhD project went beyond the standard knowledge translation template of conference presentations and publications, and followed through with extensive knowledge translation activities to move evidence into policy and practice.

Limitations of this PhD project

This PhD was nested within a national guideline development project, funded and requested by the national regulator (HPCSA), where scope, processes, outputs and decisions were made within the bounds of this project. Thus, parts of this PhD are linked to AFEM project limitations and processes. Importantly, the PhD started in 2017; at that stage, the guidelines had already been produced and ratified by the HPCSA PBEC and dissemination and implementation had already begun. Ideally, considering the PhD aim, the temporal sequence of this PhD should have commenced well before the AFEM guideline project started, informing the AFEM guideline development and implementation. In light of this, the research presented in Chapter 5 (the implementation perspectives study) was prioritised first in 2017, to support the implementation of the CPGs, given the challenges the regulator was experiencing regarding implementation during that time.

It is important to note that throughout the AFEM guideline project and during the years of the PhD, the South African prehospital regulatory, political and educational landscape changed drastically. A

new PBEC and national director for emergency medical care was appointed and paramedic short courses were closed, all while paramedics were at their most vulnerable due to continuous community attacks on ambulances³⁹. Given this evolving and volatile political and social context, it is admirable that the HPCSA PBEC supported and was involved during components of the PhD, especially Chapter 5.

However, as the project progressed, so did the political landscape, and important role-players such as the PBEC became increasingly reserved in contributing to research, for example in Chapters 3 and 4. The regulator played a major role in the successes and failures of the AFEM guidelines, especially during implementation, and their perspectives are sorely missed. Continuous efforts need to be made to involve important stakeholders throughout the guideline development and implementation process.

In line with the needs and definitions set during the AFEM guideline project, the landscape analysis excluded relevant end-user documents, such as protocols or clinical decision tools, and only included guidelines published in English. It is likely that important guidelines were missed, especially Francophone guidelines from Africa, due to the narrow definition of guidelines used. This in part motivated the scoping review for guidance documents in sub-Saharan Africa relevant to prehospital care.

In strengthening guideline development and implementation, the PhD sampled various groups of people, aligned to specific objectives, from guideline end-users, international guideline experts and guideline panel members. However, this does not include all role-players, and gaps exist, including perspectives from departments of health, prehospital managers and service providers, and members of prehospital higher education institutions. Although outside of the scope of the PhD, these stakeholder perspectives are needed in future research.

In gathering opinions of leading international guideline developers, I gathered data as voice memos and written reports as opposed to extensive in-depth interviews or focus groups. Written and self-recorded voice data provide less qualitative depth compared to focus groups or interviews, but is more time and cost efficient^{40,41}. Furthermore, experts provided a wide array of data and themes, some of which were not focused on, as they fell outside the question posed for this PhD project. In light of this, extensive in-depth interviews with guideline experts would be advantageous, especially on topics where greater uncertainty exists for alternative guideline development methods such as consolidating strengths of recommendations from heterogeneous CPGs. In Chapter 5 I applied the PRISM framework¹ to guide our research approach, however the PhD lacked an overarching conceptual or theoretical framework due to the broad and wide scope of the research questions and issues being addressed. Considering the results and reflections from the PhD, some parameters for a framework can be explored in future research, drawing from programmatic examples such as TRiADS (Translation Research in a Dental Setting)⁴².

Although the PhD focused on knowledge translation activities as ‘not just breakthrough, but follow through’, the target audience of these efforts was not always ready to receive such information. Even though the movement and uptake of evidence-based health care in Africa over the past two decades has evolved drastically⁴³, emergency care is still behind the curve, especially in South Africa, where the AFEM guidelines were, for the majority of providers, the first exposure to an evidence-based guideline product^{37,38,44,45}. This likely influenced the uptake and attitude towards the AFEM guidelines and knowledge translation products linked to this PhD. I look forward to these elements improving as the pool of prehospital guidelines and evidence-based health care users grows. The PhD knowledge translation outputs and reach are further expanded in Chapter 8.

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Chapter 7: Conclusion and priority implications for practice and research

In 2016, the first evidence-based prehospital clinical practice guideline was developed for South African paramedics, replacing outdated and eminence-based practice protocols. Alternative methods were used to develop these guidelines, but they require significant strengthening in order to address current and future guideline development and implementation challenges in South Africa and beyond, especially in low-resource settings.

Using the 2016 AFEM prehospital CPG as a case study, this PhD adds to the knowledge base on how to best develop and implement CPGs in low-resource settings. The PhD argues that in order to strengthen existing and future prehospital CPGs and end-user products, developers should use existing high-quality guidelines, together with national policy and evidence to support context-specific recommendations. I argue that when developing and implementing guidelines, careful consideration of conflicts of interest during implementation decisions must be considered, together with ensuring wide and open consultation with stakeholders. To support robust development methods, this thesis provides a critical report and roadmap for guideline development producers in low-resource settings.

Fit-for-purpose, trustworthy clinical guidance can be developed that is contextually appropriate and acceptable to the target end-users, and remains a challenging task. This is an important and relevant issue that guideline producers, professional societies and academic institutions should be acutely aware of because patients and clinicians can ill afford to make decisions based on eminence-informed guidelines rather than evidence-based guidelines.

Globally and especially in sub-Saharan Africa, the clinical guidance available to emergency care providers must be strengthened by transparently reporting the development methods used for CPGs and end-user documents. This thesis provides emergency care guideline developers with a critical reflection and roadmap for developing robust CPGs that are fit-for purpose and responsive to end-user needs.

Priority implications for practice

Guideline developers in prehospital care, especially in low-resource settings, need to be aware of and use alternative guideline development methods when developing guidelines. Furthermore, guideline development teams should consider integrating guideline implementation within the guideline development process to support end-user guideline uptake. However, when final recommendations are being considered for implementation by local, national or regional stakeholders, the role of guideline developers and those responsible for implementation should be made clear, separating the responsibilities of a clinical guideline team with another important stakeholders such as regulators and policymakers.

Downstream implementation decisions that extend beyond the mandate of a clinical practice guideline (i.e standards of practice, educational reform, policy) must be communicated and reported in a transparent manner to end-users. Guideline developers need to be aware of end-user needs and perceptions in order to navigate successful guideline development and implementation.

In sub-Saharan Africa and globally, prehospital guideline developers, journal editors and professional societies need to ensure adherence to guideline quality reporting standards when publishing any form of clinical guidance.

For emergency care providers as guideline users, evidence-based health care and guideline literacy needs to be promoted and further strengthened. Linked to this, clinicians need to be aware of guideline appraisal tools when considering the validity of guidelines produced to guide their clinical decisions.

It is important that future updates of the South African prehospital emergency care guidelines should carefully consider the findings of this PhD, incorporate the lessons learnt and take account of the key priority actions set.

Implications for future research

Future research is needed to identify prehospital topics where robust CPGs are lacking, and where the greatest impact can be felt through developing robust guidance or systematic reviews to answer priority questions.

Existing studies provide no empirical consensus on whether alternative guideline development methods are more or less cost-effective than traditional *de novo* methods. Systematic reviews or head-to-head comparative research is needed to investigate this gap in the evidence.

Further research should consider the perspectives, roles, needs and objectives of policy-makers and regulators in the South African prehospital guideline space. Such research should focus on fostering strong relationships between researchers and decision makers and encourage implementation research initiatives because improved relationships has shown potential to positively influence research, policy and practice.

Formal testing and evaluations of current methods of dealing with consolidating multiple conflicting CPG recommendations, levels of evidence, and strength of evidence recommendations during alternative guideline development are needed.

Conclusion

In conclusion, this PhD extends existing scholarship in strengthening guideline development and implementation. It argues for robust development methods in prehospital care and provides context-specific solutions for existing challenges. Together with providing priority actions, development of alternative guideline development methods and implementing an active knowledge translation strategy, current and future prehospital guidance efforts have been strengthened in South Africa. In light of this PhD, future prehospital guideline development and implementation efforts in South Africa have a stronger empirical evidence base on which to build a consolidated approach for a successful guideline enterprise that is trustworthy and applies best available evidence to patient care decisions.

Chapter 8: Knowledge translation

Transferring evidence into policy and practice is one of the biggest challenges researchers face and it goes beyond simply publishing in journals. I present this knowledge translation (KT) chapter after the PhD discussion and conclusion to emphasise and showcase the ‘follow through of research results’ philosophy and outputs of this PhD.

Knowledge translation is getting the right information to the right people, in the right format, at the right time, in the right place and in the right way to influence decision-making¹. There are various challenges in getting evidence into decision-making, commonly referred to as the ‘*know-do gap*’. These challenges at the broadest level include individual, organisational, environmental, relational and systemic barriers, most of which are outside one’s control. Considering these challenges, bridging this ‘*know-do gap*’ means balancing on a relationship tightrope suspended between the evidence and the decision makers.

In this PhD thesis a KT strategy, developed with the CEBHC, was used to increase the use and impact of evidence². This approach tailors audience-specific KT packages by defining *a priori* the who (audience), why (purpose), what (message), how (medium/forum), when (timing) and cost (resources). According to Prof John Lavis in an interview in 2012 with Sharon Straus, segmenting KT packages to specific target audiences is a hallmark of how KT strategies have evolved over time³ – and is a strategy employed in this PhD.

This chapter summarises the PhD KT impact on policy, clinical practice, and the public. Additionally, I describe different KT outputs by different stakeholders and provide a brief reflection of navigating the evidence to decision makers ‘*know-do gap*’ tightrope.

The PhD policy impact

National stakeholder meetings and guideline task team

Due to the implementation research focus of the PhD, key findings were shared and presented at the National Emergency Care Education and Training Committee (NECET) and were well received. The NECET, together with the HPCSA PBEC, sets the agenda and policy for South African Emergency Medical Care⁴.

In 2019 a national guideline implementation task team was established to provide recommendations to the HPCSA PBEC for successful guideline implementation and uptake. This PhD research was cited in internal documents and key findings presented to the PBEC by the implementation committee⁵.

A stakeholder-specific issue brief was also created and disseminated to NECET, the NDoH (for Emergency Care and Rescue), HPCSA PBEC, and Higher Institutions of Education in Emergency Care.

Research to action

Although not empirically measured and difficult to determine, much of the current implementation activities in South Africa are linked to priority actions and recommendations shared with the HPCSA and NDoH. These include:

1. Implementation of online CPG update courses
2. Development of a CPG handbook
3. Increased communication and transparency from stakeholders (i.e. HPCSA PBEC)

The PhD practice impact

Conference, workshops and scientific presentations

Output from the PhD was presented at conferences across the world, in a variety of disciplines ranging from emergency medicine to allied health. Conference outputs included keynote talks, oral presentations, forum discussions, workshops and poster presentations (listed below). Overall, research from this PhD has been cited over 30 times since 2016.

International:

1. International Conference on Emergency Medicine, Cairo, Egypt, 9-11 November 2016
2. iCAHE Conference, Adelaide, 16 November 2017 (awarded best presentation)
3. Global Evidence Summit, Cape Town, 13-16 September 2017
4. G-I-N Conference, Manchester, 12-14 September 2018
5. African Conference on Emergency Medicine, Kigali, Rwanda, 7-9 November 2018
6. 6th EMSSA International Conference, Cape Town, 2-5 October 2017

National:

6. Emergency Care Society of South Africa Conference, Cape Town, 22-23 September 2016
7. Emergency Medicine Society of South Africa Conference, Cape Town, 5-7 November 2019

Workshops and forum discussions:

8. McCaul M, Louw Q, Dizon J. Rural Health Conference 23-26 September 2015. Dunkeld Country Estate, Dullstroom, Mpumalanga, South Africa. What makes a good Clinical Practice Guideline? (Half-day workshop)
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Clinical Impact

Although the AFEM guidelines have had, and continue to have, a vast impact on South African prehospital CPG clinical practice, this PhD research has indirectly impacted clinical practice by strengthening guideline methods and implementation for stakeholders.

Additionally, the PhD research and expertise developed has led to consultancy input with the Western Cape Emergency Medical Services guideline update team, tasked with updating the Western Cape prehospital workforce to be aligned with the new guidelines.

The PhD public impact

Blogs, newsletters and social media footprint

Various blogs and video-blogs, newsletters and social media posts (Facebook and Twitter) were created, targeting the public and the South African prehospital audience. Blogs included two 'interviews with the author'^{6,7} and two co-written plain language summaries of conference

presentations regarding guideline updates^{8,9}, all aimed to get paramedics aware of the leading research effecting practice and policy.

Prehospital industry-specific newsletters have been released by large emergency medical services companies (e.g. ER24) to their national database of prehospital providers, highlighting and linking to key research outputs from this PhD¹⁰. Additionally, SAGE newsletters were released, summarising output and methods from the AFEM guideline project for stakeholders¹¹.

The vlog, uploaded to YouTube, has had over 841 views (1 July 2020) and received significant clicks via Facebook and Twitter. The video was professionally produced and delivers a key awareness-raising message regarding the PhD research to South African paramedics nationally.

Teaching impact

Lessons learnt, challenges and key findings of the PhD have been incorporated within the Stellenbosch University MSc Clinical Epidemiology Clinical Practice Guideline Module. The masters level module deals among other topics with alternative guideline development methods and has drawn from this PhD work and elsewhere¹².

This research has also been incorporated into undergraduate medical teaching at Stellenbosch University, including first- and fifth-year medical students, with topics focusing around evidence-based health care decision-making and KT.

Description of dissemination products by stakeholders

Much of the KT products produced in the PhD focused around Chapter 5, where two primary stakeholders were targeted; namely prehospital providers and national decision makers involved in guideline implementation.

Knowledge translation products for national decision makers

Brochures

The first opportunity to present the results was during the NECET meeting in 2017, where education leaders (i.e. heads of departments from all prehospital training institutions in South Africa) meet twice a year to set the agenda for prehospital education and policy. This was a major opportunity for KT for teaching and learning in higher education in prehospital care. The NECET presentation highlighted key research processes, research results and provider quotes, together with a core take-home message (see Figures 3a and b). These KT opportunities were made possible due to the research implementation approach described in Chapter 4, where the national director for prehospital care in South Africa was a collaborating partner throughout and beyond the research process.

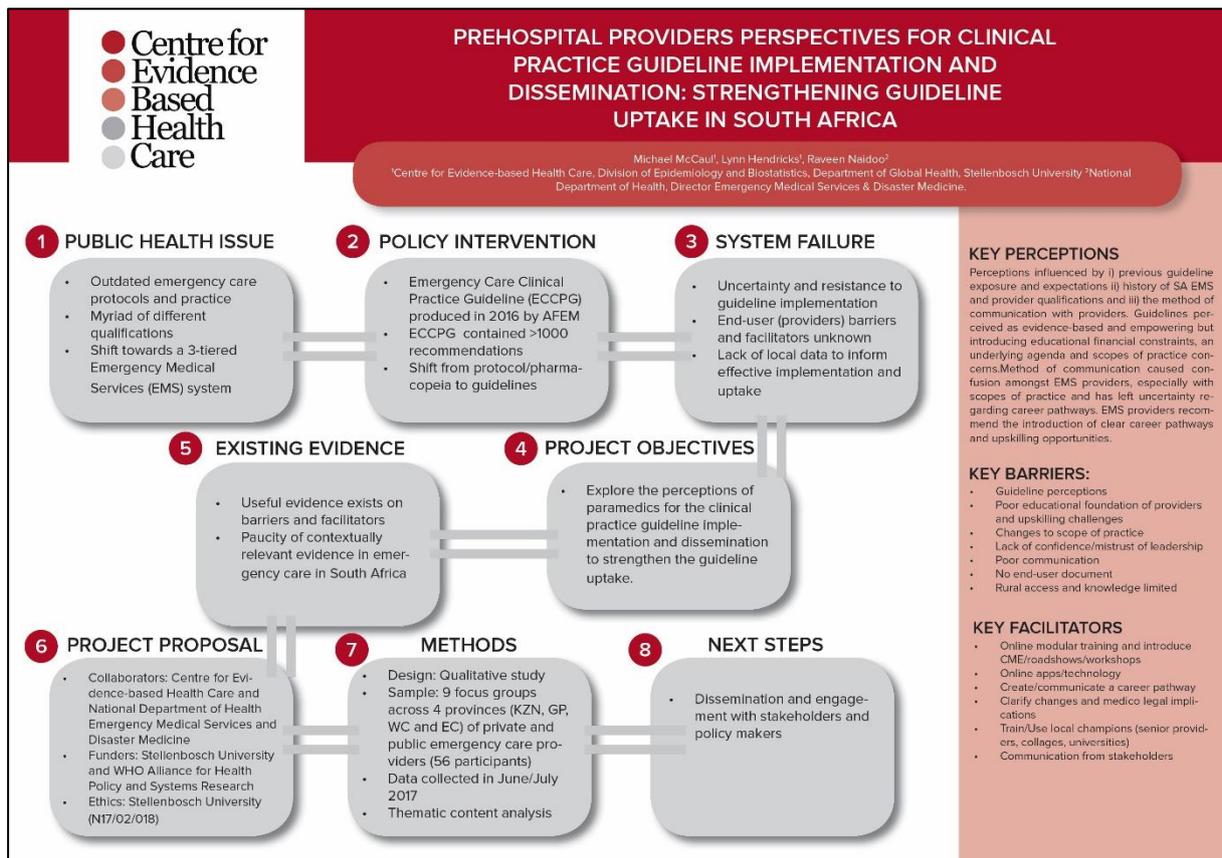


Figure 3a: Chapter 4 NECET committee pamphlet: Project overview and key findings



Figure 3b: Chapter 4 NECET committee pamphlet: 'Camera Snapshot' of prehospital provider perceptions (left) and summary of guideline implementation barriers and facilitators (right)

Even though the NECET target audience was mostly academic decision makers, the information presented was jargon free and assumed a lay person audience, drawing the focus to the key message as opposed to the research methods.

Issue brief

The KT output linked to policy-makers, specifically the South African National Department of Health and the HPCSA PBEC, included creating a decision maker-focused issue brief. Issue briefs, similar to policy briefs, aim to provide a concise summary of a particular issue and the options to deal with it, typically by stating priority actions¹³. The example issue brief displayed below was developed during the KT workshop and disseminated to key officials, including the HPCSA PBEC. The issue brief (Figure

4) provides a brief summary of the current issues to be addressed, key priority actions for stakeholders, and, when flipped over, further information including study results and implications if priority actions are ignored. For more detail, the electronic version can be viewed online (see [issue brief link](#)).

Issue Brief Centre for Evidence Based Health Care IS100

Closing the gap for prehospital guideline implementation in South Africa: A call for action

South African Emergency Care Clinical Practice Guidance: Where are we now?

Until this year, South African emergency care clinical practice had been guided by protocols - documents providing clinical practice instructions - that were last revised over a decade ago. With unclear and outdated evidence underpinning the protocols, the Health Professions Council of South Africa (HPCSA) emergency care board tasked the African Federation for Emergency Medicine (AFEM) to spearhead the revision and reformulation of the protocols using the best available evidence in late 2015. In collaboration with researchers and emergency care specialists, AFEM produced a robust clinical practice guideline (CPG) with over 1000 recommendations for South African emergency care clinical practice, currently being implemented nationally since the start of 2019.

Varied guideline uptake among paramedics; services and training compromises quality care

Paramedics and the emergency care industry had varied response to the CPGs recommendations and inferred updated scope of practice. This is due to the vast implications of the guideline roll-out strategy on emergency care service delivery, upskilling of providers, and by extension, curriculum alignment for a total of seven different qualification registries, affecting approximately 70 000 providers. Some implications are considered positive (e.g. access to effective treatments previously unavailable), others are considered negative (e.g. narrowing the scope of practice for some providers). Overall, however, the new emergency care guidelines have brought change and discourse to prehospital care in South Africa.

Results from research conducted locally of prehospital providers and of the AFEM guideline group indicated that prehospital providers, emergency service managers and emergency care educators face various challenges across different domains, tabulated below:

Domain	Challenge
Emergency Care Education	Limited training capacity to upskill paramedics within industry Monetary exploitation of paramedics by private trainers
Scope of practice changes	Lack of standardised and regulated training of providers across provinces and private/public sectors Resistance to removal of skills such as intubation
Health System	Alignment of changes to the ECA, ECT and ECP tier uncertain Uncertain economic and service delivery impact of guidelines

Priority Actions

- 1 Consult with industry leaders collaboratively to consider local challenges and solutions necessary for strengthening implementation
- 2 NDoH and HPCSA must communicate consistently and transparently with paramedics and universities during implementation decision making and roll-out
- 3 Facilitate the standardised upskilling of paramedics, aligned to the CPGs, across private/public sectors and provinces.
- 4 Guide implementation through local champions and investment into a national end-user document for paramedics

Key Findings

The challenge is to convert evidence statements to practical applications
We need wider consultation, with all role-players

Implications

Prehospital provider implications

- Implementation of transparent, clear and consistent communication processes from stakeholders will help to mend the relationship between providers and decision makers, thereby accelerating guideline uptake and compliance.

Education and training implications

- Implementation of standardised training programmes in an enabling policy or quality assurance environment is essential. Without such guidance, upskilling of existing operational paramedics will remain fractured and varied throughout industry, provinces and across private and public sectors.

Health system/service delivery implications

- Wider consultation is required with industry leaders around controversial implementation decisions. Consensus and clarity is required that is contextually acceptable, feasible and implementable for industry if clinical practice is to be improved

Patient implications

- Strengthening guideline uptake by prehospital providers will assist with ensuring patient safety, and that standardised and equitable treatment is received by all.

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This research was funded by Stellenbosch University with support from the World Health Organisation Alliance for Health Policy and Systems Research grant and the Harry Crossley Foundation.

Contact information
Michael McCaul, MSc
Division of Epidemiology and Biostatistics, Stellenbosch University
@CCBHC | @MikeMcCaul3 | Email: mmccaul@sun.ac.za

Figure 4: Issue Brief for policy and decision makers

Knowledge translation products for prehospital providers

The second target audience for the results was South African prehospital providers. Social media such as blogs and vlogs (video presentations on YouTube) was used to reach this target audience. The plan was to simultaneously release research reports, infograms, tweets, blogs and vlogs when an article was published.

Electronic research summaries, infograms, interviews and tweets

For social media, I created a few different dissemination outputs using Infogram, a social media-specific software. These outputs included a research summary for a hybrid audience, which included an executive summary (Figure 5), followed by further detail if readers were interested. The research summary is interactive, with changing data, active links and moving text as the reader scrolls through the document. The research summary is best viewed online (see Figure 5 [link](#)).



Figure 5: Research summary cover page (left) and executive summary (right)

The research summary was disseminated via Twitter and Facebook, together with interactive media-driven tweets (see Figure 6a for some examples), linked to key dissemination partners using the #hashtag and @someone twitter functions to increase reach and promote retweets.

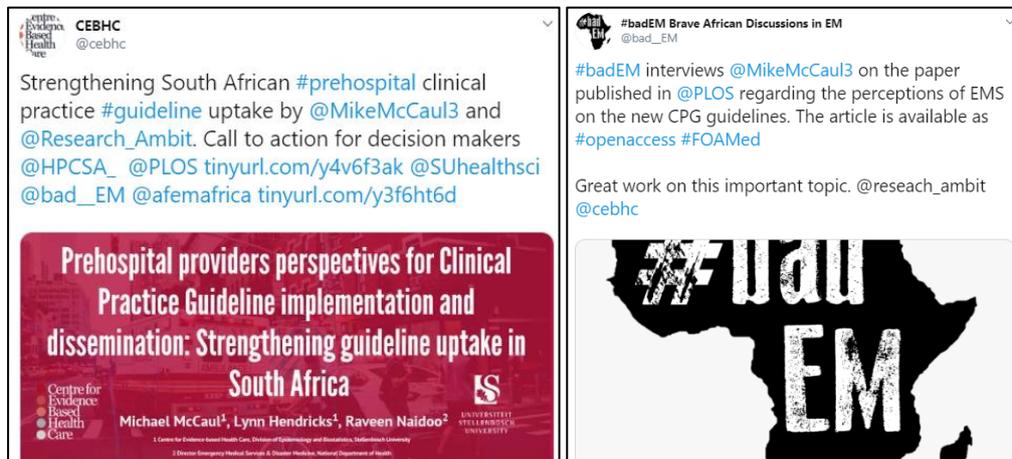


Figure 6a: Infographic Tweet from CEBHC (left) and interview with the author blog (right)

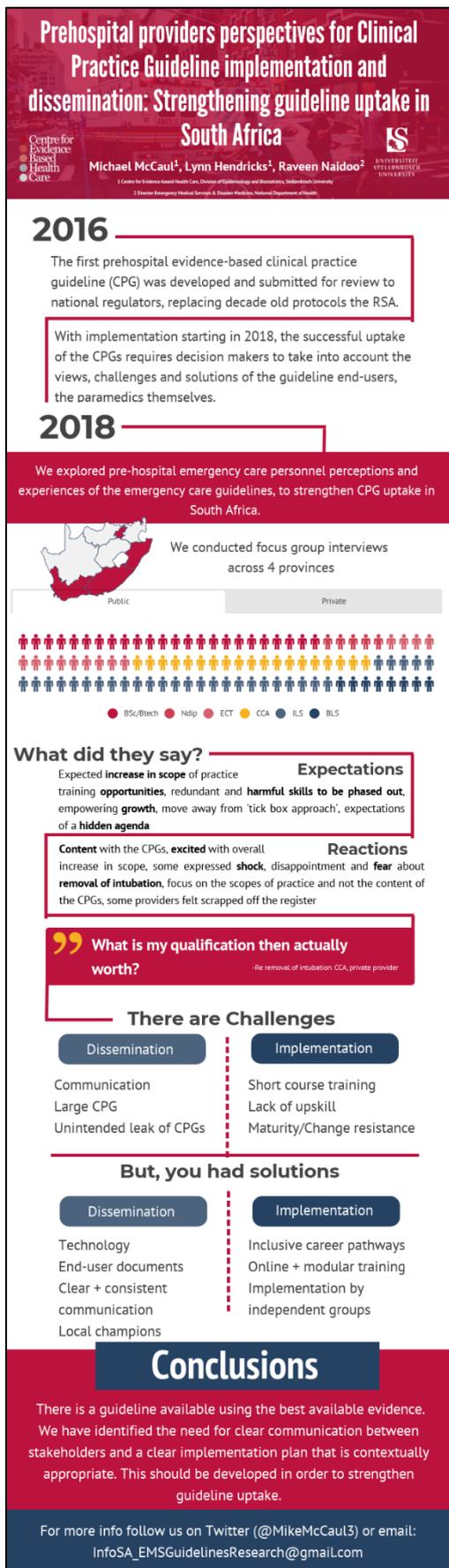


Figure 6b: Infogram example

Infographics were also created, specifically for social media platforms such as twitter and Facebook (see [link to example](#) and Figure 5b on left). The social media research awareness drive was well received and together with a well known blogging group [#BadEM](#) (Brave African Discussions in Emergency Medicine), significant traction in the social media sphere was created. This was facilitated with [#BadEM](#) 'interviews with the author', where [#BadEM](#) interviews primary authors of articles published in the African Federation Journal of Emergency Medicine (AFJEM). The first interview with the author (December 2016) was linked to an editorial published in AFJEM regarding the current status of the South African prehospital CPG (see Appendix 6). This blog was aimed at getting the key message across for South African and African prehospital providers, reporting on the SA prehospital guidelines progress and way forward (see [link for Blog 1](#)).

The second [#BadEM](#) 'interview with the author' (see [Blog 2](#)) was featured during the release of the Chapter 5 PLOSOne article and received extensive publicity online and via social media, including on prehospital-specific Facebook groups, who were specifically targeted as part of the KT strategy. The [#BadEM](#) Blog, together with the previously mentioned research summaries, infographics and social media outputs, was underpinned by a vlog, which went through various trials and errors to get in the correct format for the right audience.

Video recording/vlog

Creating an appropriate video recording for our prehospital target audience was challenging. The recordings went through various iterations as our experience evolved. The intention was to create a short and powerful video for prehospital providers to be aware of our research and to engage further around the topic. The first video, which was recorded together with Stellenbosch University's recording studio, was eventually discarded as it was too long (see Figure 7).



Figure 7: Recording studio setup (top) and speaker preparation (bottom left and right)

The end product was a 17-minute presentation of the primary study results, a short overview of the guideline product and a sit-down Q & A. The studio recording video can be viewed via this [link](#). See Figure 8 for screenshots.



Figure 8: Studio recording, speaker introduction (top), snapshot of a narrated PowerPoint slide (bottom left) and top down page-through and narration of the CPG (bottom right)

The second video attempt was to create a more focused key message for a particular target audience, in an under three-minute video. We drew from knowledge gained during a KT workshop and planned our video accordingly, drawing from best evidence examples and literature¹⁴. This video was well received and provided the backbone and reference video for all the KT output linked to Chapter 5. The video was uploaded onto YouTube on the Stellenbosch Faculty of Medicine & Health Sciences YouTube page, ensuring institutional approval and tapping into the wider Stellenbosch University dissemination network. The video description on YouTube is expandable and provides a short summary with links to other KT products, including blogs, articles, infographics and policy briefs. The video had over 800 views and downstream engagements with providers via email and messaging (1 July 2020). Figure 9 provides some snapshots of the video, while the full video can be accessed via [SU FMHS YouTube page](#).



Research: Guidelines Implementation

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Figure 9: Speaker introduction and narration (top), end-credits links and contact details (bottom)

National newsletters

With the video and related KT outputs sparking significant interest, ER24 (the largest private prehospital service provider in South Africa and Africa) released a national newsletter, linking various research outputs linked to the PhD, including the above video, to all prehospital providers in South Africa (see Figure 10). The newsletter was produced together with the ER24 training and marketing departments and can be viewed online (see [link for newsletter](#)). The newsletter was delivered to over 900 recipients, with a 43% open rate, compared to the industry standard of only 26,5% (email correspondence, ER24 Corporate Communication Manager). Of the 8 clickable items in the newsletter, the YouTube video received 47% of the clicks (the vast majority), while the PLOSOne linked article was only clicked on twice. This was part of the work linked with ER24, where they are currently starting to action the implementation of the CPG within their organisation via the ER24 learning and development department by offering CPG training to ER24 employees.



Strengthening South African prehospital guideline uptake

Developing and implementing guidelines successfully requires a clear understanding of local contextual barriers, perceptions and solutions of the guideline end-users (paramedics). Clinical practice guidelines for South African paramedics has recently been updated and is being implemented nationally, however implementation by industry and decision makers needs to be strengthened further. To address this, researchers from Stellenbosch University have conducted studies to strengthen guideline uptake by identifying prehospital end-users' perceptions of the guidelines, including barriers and facilitators for national decision makers to consider. See below for further details.

References and links in this newsletter

- [Research Summary](#)
- [Issue Brief for Decision Makers](#)
- [PLOS ONE \(Full Research Article\)](#)
- [A bit of History](#)
- [Progress and the Way Forward](#)
- [Global Emergency Guidelines State of Play](#)
- [Guidelines Methods](#)
- [Other Case Studies](#)
- [Building Capacity for Guideline Development](#)



The ER24 Learning and Development Department now offers Clinical Practice Guideline training to ER24 employees.



084 124

Visit www.er24.training and log in with your Connect credentials to view the first phase of CPG skills uploaded to the platform. Alternatively, get in contact with your region's Learning and Development Facilitator.



Research Summary

Click [here](#) to see a short overview of the research, including questions addressed and methodologies used.



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Issue Brief

Click [here](#) to see the call for action from study authors to the HPCSA PBEC and Department of Health.



Research Article

Click [here](#) to read the full research article in PLOS ONE (Open Access).

Figure 10: ER24 newsletter introduction (top left), and clickable links and descriptions (top right and bottom)

Discussion and reflection of knowledge translation activities

Throughout the course of the PhD, the KT outputs (Table 2-1) have evolved based on internal feedback and lessons learnt. As examples, the stakeholder KT output evolved from a 6-page text-heavy brochure to a two-page Issue Brief, while the video shifted from a 17-minute presentation to under three minutes, with a focused and clear message. Short powerful messages are key in the art of persuasion, including both the evidence (the *logos*), the appeal to emotions (the *pathos*) and the credibility of the speaker (the *ethos*), as described by Aristotle¹⁵, which is still relevant today.

This PhD considered these elements as key facets in its KT strategy by i) including citations to published evidence; ii) shaping an overarching narrative or story; and iii) varying the messenger based on target audience. Furthermore, our KT efforts in this PhD was guided by key design principles for stakeholder engagement set out by Boaz *et al.* (2018). Of note, these included: i) planning stakeholder engagement as part of the PhD programme of work; ii) allowing for flexibility in research processes to accommodate stakeholder engagement; and iii) *a priori* identification of resources and cost for stakeholder engagement¹⁶.

Table 2-1: Summary of KT activities in the PhD

KT Activities	Description	Target audience	Engagement
Stakeholder meetings and input	Tailored presentations and executive summaries of research results	National department of Health, HPCSA PBEC, higher education institutions	Presented at bi-annual meeting in 2017, with email correspondence and at key conferences (e.g. AFCEM 2018, EMSSA 2017, ICEM 2016)
Conference presentations and workshops	Oral and poster presentations and workshops of research output	Researchers, scientists and clinicians	Presented output at 7 conferences and incorporated into 4 forums discussions/ workshops
Social media engagement	Focused Tweets and Facebook posts via personal and institutional accounts	Lay people/public	Consistent re-tweets and shares on Facebook; active responses and comments from readers
Issue briefs	Tailored summaries and action points for key stakeholders	National department of Health, HPCSA PBEC	Disseminated via email correspondence, during conferences
Teaching and learning	Incorporated into teaching and learning at Stellenbosch University CPGs module and selected undergraduate modules	Students and academia	Presented in structured MSc Clinical Epidemiology (CPG module)
Newsletters, blogs and videos	Tailored summaries of research output in different forms	Laypeople, prehospital clinicians	>800 views and 1000 clicks nationally

On reflection, in relation to the PhD, the KT activities provided a significant opportunity for growth beyond publishing new research. In order to reach the target audience, creative risks had to be taken – especially into areas typically outside of traditional academic writing and publishing – such as blogging, vlogging and creating issue briefs. Furthermore, successful KT requires investment into relationships and stakeholder dialog, where problem-solving and critical thinking is tested. This was particularly needed as stakeholder engagement waxed and waned as the prehospital political context and power narratives shifted. As described by Jessani *et al.* (2020), the dissolution of researcher-stakeholder relationship can be triggered by reliance on a champion. This, while beneficial, could also be a hindrance in a shifting and volatile political landscape as seen during this PhD¹⁷. Consequently, in order to manage the ‘know-do gap’ tightrope, careful attention must be paid to the kind of KT follow up that each stakeholder requires. This can be done via a stakeholder analysis whereby stakeholders are ranked according to their influence and level of engagement required.

In conclusion, this PhD produced varied KT products, each tailored to a specific target audience. Additionally, the KT products reached and impacted policy and practice, and showcased the act of navigating the “know-do gap”.

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Appendices

Appendix 1 AFEM Clinical Practice Guideline

This AFEM CPG is unfortunately too large to attach as a hard copy in this page. For interest, one can view the full guideline via the below link:

<https://drive.google.com/drive/folders/1QxQZ8HaPYt7-4YnpSgZfqiaiWnGHVjb7?usp=sharing>

Appendix 2.1 Social Media Engagement

<https://twitter.com/AfJEM/status/1055090162336780288>

<https://twitter.com/MikeMcCaul3/status/1040260829298475008>

<https://twitter.com/cebhc/status/1039860180715020291>

<https://twitter.com/MikeMcCaul3/status/1056872702970073088>

Appendix 2.2 Poster presentation

<https://infogram.com/1tkr84rdyoe488uezz0le2wzg2clo9ddmw0>

Global emergency care clinical practice guidelines: A landscape analysis

Michael McCaul¹, Mike Clarke^{1,2}, Stevan Bruijns³, Peter Hodgkinson³, Ben de Waal⁴, Jennifer Pigoga³, Lee Wallis^{1,5}, Taryn Young¹

¹Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Stellenbosch University, ²Centre for Public Health, Queen's University Belfast, Northern Ireland, ³Division of Emergency Medicine, University of Cape Town, ⁴Department of Emergency Medical Sciences, Cape Peninsula University of Technology, ⁵Division of Emergency Medicine, Stellenbosch University.

Background

Adaptive guideline development methods, as opposed to de novo (new) guideline development, is dependent on access to existing high-quality up-to-date clinical practice guidelines (CPGs). We described the characteristics and quality of CPGs relevant to prehospital care worldwide in order to strengthen guideline development in low-resource settings.

Heat map of producers of prehospital CPGs



Methods

We conducted a descriptive study of a database of global and local CPGs relevant to emergency care produced by the African Federation for Emergency Medicine (AFEM) CPG project in 2016. Guideline quality was assessed with the AGREE II tool. End-user documents such as protocols, care pathways and algorithms were excluded.

Results

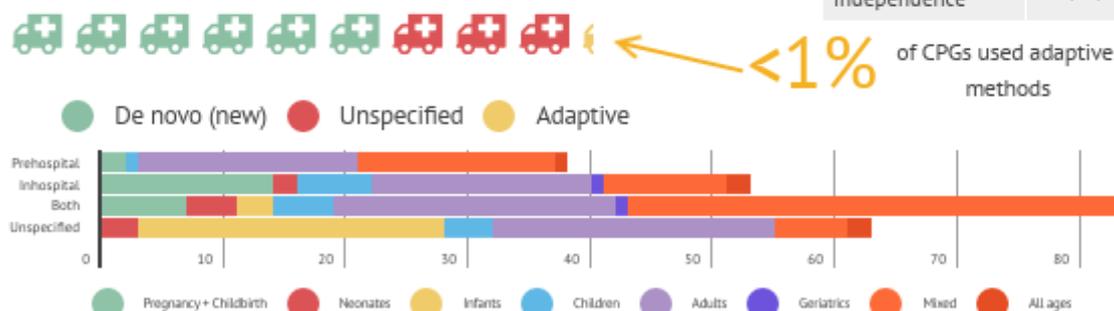
In total, 276 guidelines were included. Less than 2% of CPGs originated from low-to-middle income countries and only 15% (n=38) of guidelines were prehospital specific, and there were no CPGs directly applicable to prehospital care in resource-constrained settings. CPG quality varied (Table 1) and gaps in prehospital guideline topics was identified (Figure 2). Less than 1% of guidelines used adaptive methods.

Table 1: CPG AGREE II Scores

AGREE II Domains	Median (Range)
Scope and purpose	72 (24)
Stakeholder involvement	47 (51)
Rigor of development	61 (29)
Clarity of presentation	85 (16)
Applicability	38 (38)
Editorial independence	46 (19)

Implications and Conclusions

Resource strapped guideline developers than cannot afford de novo guideline development have access to an expanding pool of high quality prehospital guidelines to translate to their local setting. Although some high quality CPGs exist relevant to emergency care, none directly addresses the needs of pre-hospital care in low-to-middle income countries, especially in Africa. Strengthening guideline development capacity including adaptive guideline development methods that use existing high-quality CPGs is a priority.



Ethics, acknowledgements and conflicts of interest

This research was approved by Stellenbosch University ethics committee (S17/05/069). The authors would like to acknowledge the African Federation for Emergency Medicine guideline panel for their invaluable contribution to the guideline database and critical appraisal. Original CPG work commissioned by the HPCSA PBEC, but had no role in the development or methods of this article.

@CEBHC @MikeMcCaul3
Email: mmccaul@sun.ac.za

Appendix 3.1 Social Media Engagement

<https://twitter.com/cebhc/status/1149187897419010048?s=20>

<https://twitter.com/cebhc/status/1149202786611007489?s=20%20>

Appendix 3.2 Adaptive guideline development process

De Novo approach	AFEM Alternative approach
1. Organisation, budget, planning and training	*
2. Priority setting	*
3. Guideline group membership	Include advisory board (clinical and methodological)
4. Establish guideline group processes	Include decision framework for using existing guidelines and recommendations
5. Identify target audience and topic selection	*
6. Consumer and stakeholder involvement	*
7. Conflicts of interest	*
8. Question generation	Create broader questions that are transferable to key priority areas applicable and likely to be reported in guidelines
9. Considering importance of outcomes and interventions, values, preferences and utilities	*
10. Deciding what evidence to include and searching for evidence	Clearly defining inclusion of high-quality, up-to-date guidelines and performing comprehensive searches including guideline clearinghouses, Google and traditional databases
11. Summarising evidence and considering additional information	Mapping evidence and/or guidelines by priority areas and/or questions
12. Judging quality, strength or certainty of a body of evidence	Using AGREE II appraisal for guidelines and ranking included guidelines by date, relevance and overall quality
13. Developing recommendations and determining their strength	Adopting, adapting or contextualising guidelines Extracting recommendations relevant to priority areas and questions Reviewing adopted, adapted or contextualised recommendations with advisory boards
14. Wording of recommendations and of considerations about implementation, feasibility and equity	Reporting original wording of recommendations levels of evidence and/or strength in plain language Considering implementation points and practice points for each recommendation that has been adopted or contextualised
15. Reporting and peer review	*
16. Dissemination and implementation	*
17. Evaluation and use	*
18. Updating	*

*Indicates processes that are the same or implicit in both pathways.

Appendix 3.3 Semi-structured interview schedule

Example Interview 1

De Novo approach	AFEM Alternative approach	Example Probing Questions
1. Organisation, budget, planning and training	*	
2. Priority setting	*	Reflecting on the current priority areas in the prehospital guidelines, do you believe they have addressed the right priorities? Are there any gaps?
3. Guideline group membership	Include advisory board (clinical and methodological)	Reflections on the membership of the advisory group. Did the composition of the advisory group impact on the uptake of the guidelines by paramedics? What was missing re membership or representation on the advisory board?
4. Establish guideline group processes	Include decision framework for using existing guidelines and recommendations	Can we touch on your perceptions of the guideline development process? Can you reflect on the process of progressing international evidence to recommendations? And now on the local implementation process?
5. Identify target audience and topic selection	*	Any comments on how the topics for the guideline were established? Recommendations for future topics? Gaps?
6. Consumer and stakeholder involvement	*	Paramedics who will use this guideline. Have they been engaged sufficiently to enable them to take up guideline? Communication? Can you reflect on the engagement and involvement of consumers and end-users of the guidelines? Do you believe this could have been done better? How?
7. Conflicts of interest	*	Do you think COI were appropriately handled? What can you offer about declaring interests?
8. Question generation	Create broader questions that are transferable to key priority areas applicable and likely	

	to be reported in guidelines	
9. Considering importance of outcomes and interventions, values, preferences and utilities	*	
10. Deciding what evidence to include and searching for evidence	Clearly defining inclusion of high-quality, up-to-date guidelines and performing comprehensive searches including guideline clearinghouses, Google and traditional databases	Can you comment around the process that was taken using international guidelines and current best evidence to inform the local guideline writing?
11. Summarising evidence and considering additional information	Mapping evidence and/or guidelines by priority areas and/or questions	
12. Judging quality, strength or certainty of a body of evidence	Using AGREE II appraisal for guidelines and ranking included guidelines by date, relevance and overall quality	
13. Developing recommendations and determining their strength	Adopting, adapting or contextualising guidelines Extracting recommendations relevant to priority areas and questions Reviewing adopted, adapted or contextualised recommendations with advisory boards	Can you give me your opinion of the way the recommendations were written, and the evidence strength statements underpinning them?
14. Wording of recommendations and of considerations about implementation, feasibility and equity	Reporting original wording of recommendations levels of evidence and/or strength in plain language Considering implementation points and practice	Wording assisting in end-user uptake in local contexts? How well was the system prepared to take on the changes related to evidence-based recommendation implementation?

	points for each recommendation that has been adopted or contextualised	What recommendations could you make to get implementation underway? What lessons have you learnt with implementation?
15. Reporting and peer review	*	How well were the guidelines peer-reviewed? How well was industry engaged in feedback to the guidelines?
16. Dissemination and implementation	*	Can you comment on the way the guidelines were originally disseminated? Could this have been done better? There has been some time period which has happened between dissemination and implementation. Do you have ideas about how this can be moved along?
17. Evaluation and use	*	Any feedback on the way the guideline uptake can be evaluated? And feedback on its usefulness in different settings? And uptake?
18. Updating	*	Thoughts on how this could be done efficiently? Can implementation be included in the updating process?

Appendix 4.1 Social media and knowledge translation engagement

SAGE guideline panel discussion:

<https://www.youtube.com/watch?v=n4ReDJe3Up8>

The SAGE Guidelines Toolkit

The Guidelines Toolkit was developed by the SAGE project. It provides a free comprehensive guideline resource which draws on the available and current up-to-date leading benchmark literature pertaining to clinical guidelines. The toolkit describes how to search for guidelines, how to develop guideline questions, and how to adopt, adapt or conceptualise existing clinical guidelines. The PhD student was involved in developing the website.

<https://guidelinetoolkit.org.za/>

Appendix 5.1 Social media engagement and knowledge translation output

Appendix 5.1.1 Twitter

<https://twitter.com/MikeMcCaul3/status/1047852478199488512>

https://twitter.com/Research_Ambit/status/1047480910193610752

https://twitter.com/Research_Ambit/status/1047479758718689280

<https://twitter.com/MikeMcCaul3/status/1040255167348789248>

Appendix 5.1.2 Policy briefs

<https://infogram.com/1t4dez40pvo47pcwe4kklgm3p8bd0xywwdw>

Issue Brief



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S100
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Closing the gap for prehospital guideline implementation in South Africa: A call for action

South African Emergency Care Clinical Practice Guidance: Where are we now?

Until this year, South African emergency care clinical practice had been guided by protocols - documents providing clinical practice instructions - that were last revised over a decade ago. With unclear and outdated evidence underpinning the protocols, the Health Professions Council of South African (HPCSA) emergency care board tasked the African Federation for Emergency Medicine (AFEM) to spearhead the revision and reformulation of the protocols using the best available evidence in late 2015. In collaboration with researchers and emergency care specialists, AFEM produced a robust clinical practice guideline (CPG) with over 1000 recommendations for South African emergency care clinical practice, currently being implemented nationally since the start of 2019.

Varied guideline uptake among paramedics; services and training compromises quality care

Paramedics and the emergency care industry had varied response to the CPGs recommendations and inferred updated scope of practice. This is due to the vast implications of the guideline roll-out strategy on emergency care service delivery, upskilling of providers, and by extension, curriculum alignment for a total of seven different qualification registries, affecting approximately 70 000 providers. Some implications are considered positive (e.g. access to effective treatments previously unavailable), others are considered negative (e.g. narrowing the scope of practice for some providers). Overall however, the new emergency care guidelines have brought change and discourse to prehospital care in South Africa.

Results from research conducted locally of prehospital providers and of the AFEM guideline group indicated that prehospital providers, emergency service managers and emergency care educators face various challenges across different domains, tabulated below:

Domain	Challenge
Emergency Care Education	Limited training capacity to upskill paramedics within industry
	Monetary exploitation of paramedics by private trainers
	Lack of standardised and regulated training of providers across provinces and private/public sectors
Scope of practice changes	Resistance to removal of skills such as intubation
	Alignment of changes to the ECA, ECT and ECP tier uncertain
Health System	Uncertain economic and service delivery impact of guidelines

Priority Actions

- 1

Consult with industry leaders collaboratively to consider local challenges and solutions necessary for strengthening implementation
- 2

NDoH and HPCSA must communicate consistently and transparently with paramedics and universities during implementation decision making and roll-out
- 3

Facilitate the standardised upskilling of paramedics, aligned to the CPGs, across private/public sectors and provinces.
- 4

Guide implementation through local champions and investment into a national end-user document for paramedics

Key Findings

1

Involving local champions, development of end-user documents and enabling inclusive career pathways for existing short course paramedics can strengthen implementation

2

Insufficient consultation and collaboration on service delivery, education/training and resource needs by decision makers and experts

3

Unclear guideline implementation strategy communicated to the emergency care industry by HPCSA and NDoH

4

Poor communication regarding implementation from professional board to pre-hospital providers and stakeholders creates disconnect



The challenge is to convert evidence statements to practical applications

We need wider consultation, with all role-players

Implications

Prehospital provider implications

- Implementation of transparent, clear and consistent communication processes from stakeholders will help to mend the relationship between providers and decision makers, thereby accelerating guideline uptake and compliance.

Education and training implications

- Implementation of standardised training programmes in an enabling policy or quality assurance environment is essential. Without such guidance, upskilling of existing operational paramedics will remain fractured and varied throughout industry, provinces and across private and public sectors.

Health system/service delivery implications

- Wider consultation is required with industry leaders around controversial implementation decisions. Consensus and clarity is required that is contextually acceptable, feasible and implementable for industry if clinical practice is to be improved

Patient implications

- Strengthening guideline uptake by prehospital providers will assist with ensuring patient safety, and that standardised and equitable treatment is received by all.

References

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This research was funded by Stellenbosch University with support from the World Health Organisation Alliance for Health Policy and Systems Research grant and the Harry Crossley Foundation.

Contact information

Michael McCaul, MSc
 Division of Epidemiology and Biostatistics, Stellenbosch University
 @CEBHC | @MikeMcCaul3 | Email: mmccaul@sun.ac.za

Appendix 5.1.3 Online research summaries

For best results see the link: <https://infogram.com/1tlecox7x0g09uvz2ezepwrqpsol72kk02>



November 2018

Centre for Evidence-based Health Care

Research Summary

Prehospital providers' perspectives for Clinical Practice Guideline implementation and dissemination: **Strengthening guideline uptake in South Africa**

Michael McCaul (PI)

Researcher, Centre for Evidence-based Health Care

Lynn Hendricks

Researcher, Centre for Evidence-based Health Care

Raveen Naidoo

Director Emergency Medical Services & Disaster Medicine, National Department of Health

The main points

What question did this research address?

We explored prehospital emergency care personnel **perceptions** and **experiences** of the emergency care guidelines, to **strengthen guideline uptake** in South Africa.

Why is the question important?

In order for the evidence-based guidelines to be implemented successfully, decision makers require an understanding of the **contextual issues** and **solutions** of the guideline end-users.

What did we do?

We conducted a national **qualitative study** across the four major provinces in South Africa. We convened focus groups of operational **emergency care providers**, from various qualifications, from both private and public, from both rural and urban providers.

What were the main findings?

Guideline implementation and dissemination in South Africa can be strengthened by:

- Providing **clear** and **consistent communication** to providers
- Using **local champions** to lead in guideline uptake
- Using technology (e.g. apps) to **create end-user documents**
- Create **inclusive career pathways** and provide online and modular training
- **Implement guidelines** by independent groups

Where can I find out more?



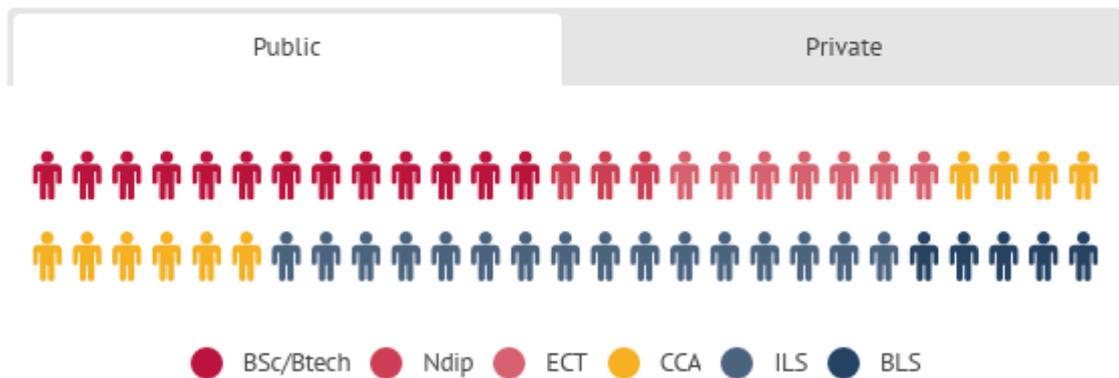
Introduction

In 2016 the first African emergency care clinical practice guideline (CPG) was developed for national uptake in the prehospital sector in South Africa, with implementation starting in 2018. However, comprehensive uptake of CPGs post development is not a given, as this requires effective and efficient dissemination and implementation strategies that take into account the perceptions, barriers and facilitators of the local end-users.

Decision makers, including industry service providers, the National Department of Health, regulators and training institutions need to be aware of the perceptions, experiences, challenges and solutions expressed by prehospital providers for guideline implementation and dissemination in order to strengthen guideline uptake and have lasting impact on patient outcomes. **We sought to understand prehospital providers' experiences and challenges of guideline implementation and dissemination.**

Methods

Our study employed a descriptive qualitative research design, including nine focus groups with 56 operational emergency care providers across four major provinces in South Africa. Data was analysed using thematic analysis in ATLAS.ti. Ethics approval was provided by Stellenbosch University.



Main Findings



When asked, what was your

Expectations

before you saw the guidelines, you said...

“ I expected the up skill, it's been known South African EMS we have been lagging behind... ”

ECT, private sector

“ [the guidelines]...has the potential to drive a certain perceived agenda within the industry ”

CCA, private sector

“ Support and growth for the entire industry, all levels... ”

BAA, private sector

“ Broaden the views for us to be able to think out of the box ”

ECT, public sector

When asked, what was your

Reactions

when you saw the guidelines, you said...

“ We've got better focus on areas that have been traditionally horribly neglected such as the management of the obstetric patient ”

ECP, private sector

“ [re upskill] For me as a BAA it's a good thing because I will learn more ”

BAA, public sector

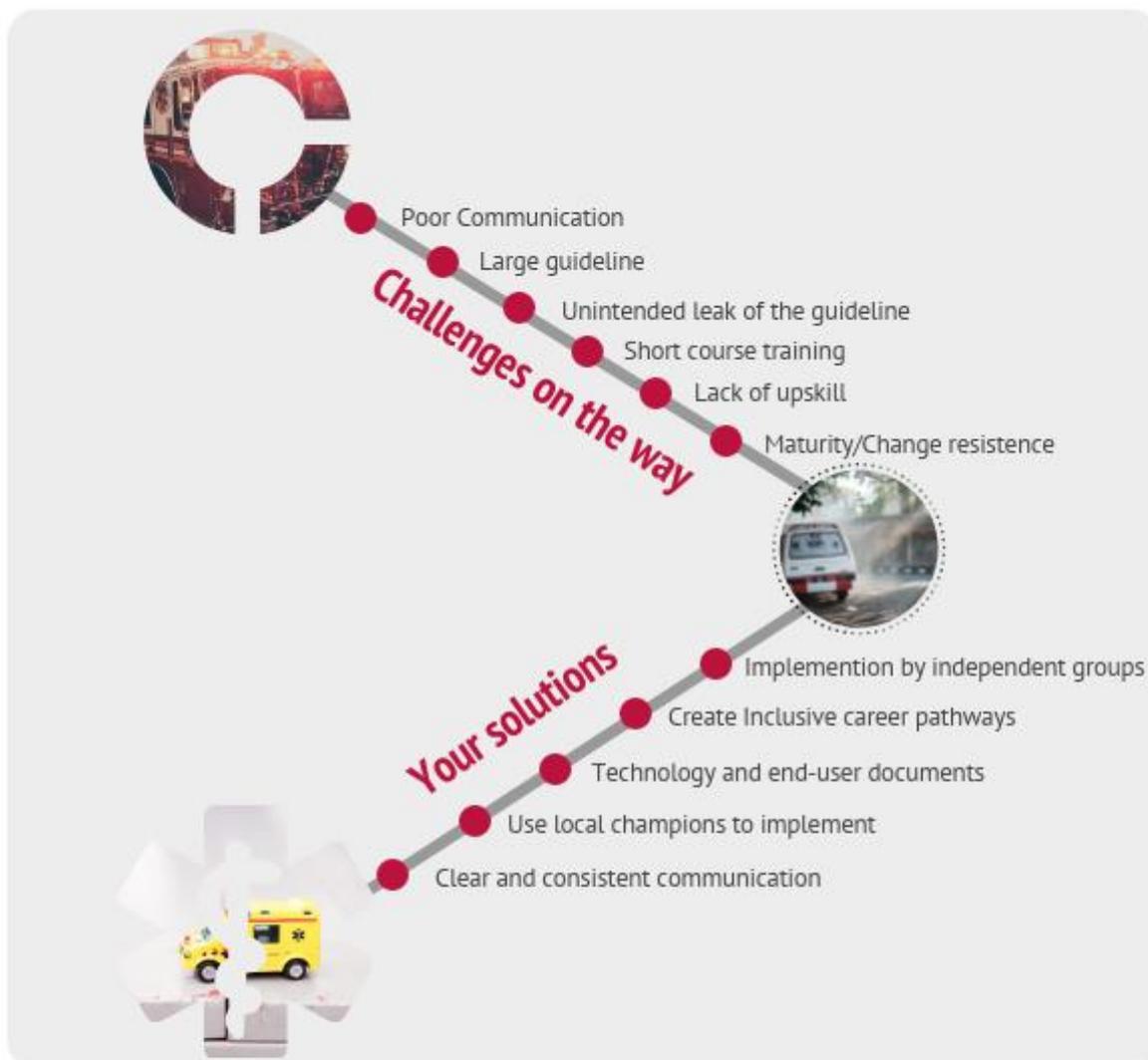
“ [re removal of intubation] NDips and CCA's are the only ones that are actually registered as paramedics with the HPCSA, but now we are not paramedics anymore ”

CCA, private sector

“ What's the point of the three hundred to four hundred pages? You could just have given me this, that's my scope, if it's out of my scope I don't really need to read the guidelines ”

ECT, public sector

Towards solutions



Take home message

There is a guideline available using the best available evidence. We have identified the need for clear communication between stakeholders and a clear implementation plan that is contextually appropriate. This should be developed in order to strengthen guideline uptake.

About the research team



Michael McCaul

Michael is a guideline development and evidence-based health care researcher with experience in clinical epidemiology, evidence synthesis, biostatistics and prehospital care. He is passionate about getting people to make evidence-informed decisions and getting evidence into policy and practice. Michael is a senior lecturer, Division of Epidemiology and Biostatistics at Stellenbosch University.



Lynn Hendricks

Lynn is a research psychologist and epidemiologist with a special interest in qualitative methods development for primary research and systematic reviews and knowledge translation. She is currently a researcher the Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics at Stellenbosch University.



Raveen Naidoo

Raveen is the National Director of Emergency Medical Services and Disaster Management in South Africa. Raveen has extensive experience in prehospital policy, clinical practice, regulation and education. Raveen has held various professional positions, such as Head of Department at Durban University of Technology Department of Emergency Care and Chairperson for the Professional Board of Emergency Care, Health Professions Council of South Africa.

Funding and support

This publication was funded by Stellenbosch University with support from the World Health Organisation Alliance for Health Policy and Systems Research grant. Lastly, we would like to thank all the prehospital providers, from across South Africa, without whom this study would not be possible.

Appendix 5.1.4 Knowledge translation video
<https://www.youtube.com/watch?v=4hREvA7Ccdg>



Appendix 5.1.5 Conference poster

<https://infogram.com/1t711zleegddrdcw2e83oqe64f1440odde>

Prehospital providers perspectives for Clinical Practice Guideline implementation and dissemination: Strengthening guideline uptake in South Africa

Centre for Evidence Based Health Care

UNIVERSITEIT STELLENBOSCH UNIVERSITY

Michael McCaul¹, Lynn Hendricks¹, Raveen Naidoo²

¹ Centre for Evidence-based Health Care, Division of Epidemiology and Biostatistics, Stellenbosch University
² Director Emergency Medical Services & Disaster Medicine, National Department of Health

Background

In 2016 the first African emergency care clinical practice guideline (CPG) was developed for national uptake in the South African prehospital sector. Comprehensive uptake of CPGs post development is not a given, as this requires effective and efficient dissemination and implementation strategies that take into account the perceptions, barriers and facilitators of the local end-users.

We explored pre-hospital emergency care personnel perceptions and experiences of the emergency care guidelines, to strengthen CPG uptake in South Africa.

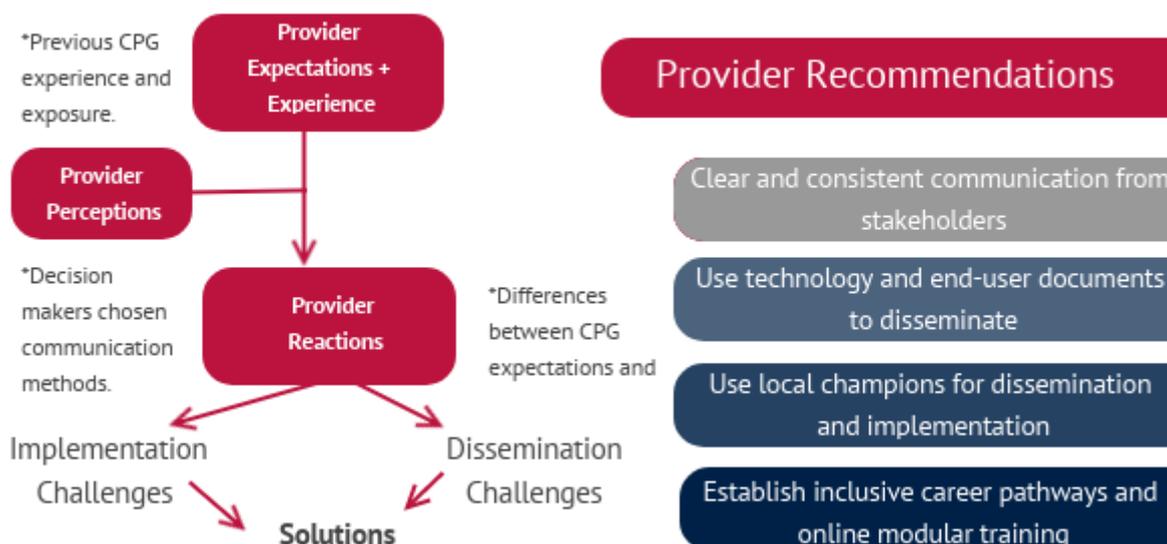
Methods

We conducted a qualitative study using an interpretivist phenomenology approach. We convened focus groups of operational emergency care providers guideline end-users across four major provinces in South Africa. Data was analysed using thematic content analysis in Atlas.ti.



Results & Discussion

Nine focus groups were conducted with a total of 56 participants. Major themes included factors that influence perceptions of CPGs; and barriers and facilitators of CPG dissemination and implementation.



Ethics and Funding

SU Ethical approval (N17/02/2018). This project was supported by the WHO Alliance for Health Policy and Systems Research.

Appendix 5.1.6 Blog posts and Infograms

<https://infogram.com/1tgl18kwqv98s400g2e6wqpwbpx2vqv26>

Appendix 5.1.7 National newsletters

South African Guideline Excellence Project Newsletter September 2016 (Ed. 3)

<https://www.samrc.ac.za/sites/default/files/attachments/2016-10-04/SAGENewsletterSeptember2016.pdf>

South African Guideline Excellence Project Newsletter December 2017 (Ed. 5)

<https://www.samrc.ac.za/sites/default/files/attachments/2018-04-03/SAGEdecember2017.pdf>

ER24 Newsletters:

<https://payg.rocketseed.net/public/messages/view-online/zYt1w3Jyl6pG0l6d/KNkx2QrIbC3XK3pJ/0d1tw30HHSsleahZ>

Appendix 6. Brief reflection and linked publications

Brief reflection on grantsmanship, teaching and learning and capacity building

Conducting research is often a time-consuming and resource-intensive endeavour, all of which has a monetary cost. This is particularly true when PhD students are employed full time, and PhD work is left for after hours or weekends, such as the case in this PhD. In order to create protected time for my PhD research, I was successful in obtaining various research grants in order to complete the PhD in a timely manner. Some of the successful funding grants include the Early Research Career Mentorship Programme (2016), Newton Fund & MRC Trauma & Injury Research Fund (2016), the HB & MJ Thom Award (2017), Strengthening Capacity for Implementation Research Initiative (2018), and the Harry Crossley Foundation Funding (2018). I was the primary applicant for all competitive research grants, and together with clear supervision and mentorship, built significant capacity in grantsmanship and grant writing. I also successfully supervised and mentored postgraduate students' research projects and their own grant funding applications for conference travel and research costs, linked to work in this PhD.

The knowledge and expertise generated through this PhD was also linked to the South African Guideline Excellence Project and further supported national and regional guideline development capacity. This was done via development of an online guideline toolkit and revamp of an NQF 9 12-credit module on guideline development, part of the MSc in Clinical Epidemiology at Stellenbosch University, for which I am the module co-convenor and programme co-coordinator. Additionally, linked to the COVID-19 pandemic and 'infodemic', I have been involved with the recommending working group part of [COVID-END](#), an evidence network to support COVID decision making.

Furthermore, in line with capacity building, throughout my doctoral journey, rapid exposure, experience and appreciation of qualitative research and methods was fostered, mostly due to the predominantly qualitative weighting of the PhD. This evolution in expertise and capacity is significant, not just from a doctoral perspective, but also a personal one, as my expertise at the start of the PhD journey was almost exclusively grounded in a quantitative positivist framework, as my expertise was predominantly in clinical epidemiology and biostatistics.

Linked PhD publications

This Appendix sub-section presents various linked peer-review publications linked to work in this PhD.

McCaul M, Grimmer K. Pre-hospital clinical practice guidelines – Where are we now? *African J Emerg Med*. 2016;6(2):61-63. doi:10.1016/j.afjem.2016.05.001.

(<https://www.sciencedirect.com/science/article/pii/S2211419X16300337>).

McCaul M, de Waal B, Hodkinson P, Grimmer K. South African pre-hospital guidelines: Report on progress and way forward. *African J Emerg Med*. 2016;6(3):113-115. doi:10.1016/j.afjem.2016.08.004.

(<https://www.sciencedirect.com/science/article/pii/S2211419X16301069>).

Louw Q, Dizon JM, Grimmer K, **McCaul M**, Kredo T, Young T. Building capacity for development and implementation of clinical practice guidelines. *South African Med J*. 2017;107(9):745-746. doi:10.7196/SAMJ.2017.v107i9.12527.

(http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S0256-95742017000900014).

Young T, Dizon JMR, Kredo T, **McCaul M**, Ochodo E, Grimmer K, Louw Q. Enhancing capacity for clinical practice guidelines in South Africa. *Pan African Medical Journal*. 2020. Volume 36 10.11604/pamj.2020.36.18.20800

(<https://www.panafrican-med-journal.com/content/article/36/18/full/>).