# Anaesthesiology and research in South Africa: a proposal for a national collaborative anaesthesiology research group

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**Keywords:** research, anaesthesia

## Abstract

Anaesthesiology research is currently uncoordinated on a national level in South Africa. Recently, the Academy of Science of South Africa published a report on *Revitalising clinical research in South Africa*, in which recommendations to increase clinical research in South Africa were made. In addition, the recent requirement for a research project as part of specialist training means that presently there is an incentive to increase clinical research in South Africa. Based on factors known to be associated with research productivity, a proposal is made for the establishment of a national, collaborative research group. To ensure the success of this venture, this collaborative group should address the six factors of research productivity identified by Kern: funding of the research; the quality of the investigators; the efficiency of the institution; the mix of the research projects based on novelty, incremental advancement and confirmatory studies; analytic accuracy and a passion for the research projects. A 'South African virtual perioperative research institute' is proposed to coordinate anaesthesiology research within South Africa. A research agenda, based on core research themes for South Africa, should be established. This national collaboration would ensure that all the necessary components for a productive research programme are addressed through a collaborative effort.

Ⓟ Peer reviewed. (Submitted: 2012-10-15. Accepted: 2012-12-06.) © SASA

South Afr J Anaesth Analg 2013;19(2):89-94

## Introduction

The publication of the Academy of Science of South Africa (ASSAf) report on *Revitalising clinical research in South Africa,*[1]and the recent requirement for registrars to complete a research project prior to specialist registration, provide the necessary catalyst for re-establishing clinical anaesthesiology research in South Africa.

The ASSAf report was published in 2009.[1] It provides clear recommendations for government, institutions and individuals on how to develop clinical research in South Africa. Clinical research has a core public health function as it informs appropriate population health care and provides a platform for the suitable teaching and training of clinicians. Therefore, the committee recommended that the status of clinical research in South Africa should be raised.[1]

Advocated strategies and principles included increasing public awareness of the importance of clinical research, ensuring that all clinical research is of an ethical nature and continuing to build on the trend of increased clinical research publications within South Africa. It was recommended that participation in doctoral programmes needs to be improved and that the associated research output should be promoted through a national plan for research development, on both an individual and a large-scale organisational or institutional level, for e.g. the Medical Research Council and the National Research Foundation (NRF). A recommendation was made for the establishment of a national clinical research coordinating centre for clinical research in South Africa, and also that government should increase its expenditure on clinical research to 2% of the gross domestic product to ensure the necessary financial resources to support and ensure clinical research success. Finally, it was proposed that organisational functions and processes should be improved, together with government commitment to these processes and government partnership.

Against the background of ASSAf's recommendation of revitalising clinical research, further impetus for clinical research has been provided by the recent additional requirement for a completed research project before registration as a specialist. While this requirement presents a massive undertaking for university anaesthesiology departments in South Africa, it simultaneously provides a unique opportunity to coordinate research agendas and

to potentially rejuvenate clinical anaesthesiology research. A coordinated research agenda would mean that many potential Master's research dissertations could be used to establish credible research programmes in South Africa.

Unfortunately, it appears that little has been done in response to the ASSAf report. There has also been limited interdepartmental collaboration to facilitate research programmes. There is now the necessary impetus to prioritise clinical research at a national level. Anaesthesiology in South Africa could provide a successful model for revitalising clinical research, while simultaneously ensuring a relevant research contribution to the international literature by the South African anaesthesiology community.

The aim of this review was to identify the components necessary for successful research and publication productivity. Based on this evidence, the plan is to develop and propose a feasible model in order to increase research productivity in the South African anaesthesiology community.

## Characteristics associated with research productivity

A model of the components that are necessary for successful academic research productivity was recently proposed by Kern.[2] It consists of six factors: funding of research; the quality of the investigators; the efficiency of the institution; the mix of the research projects based on novelty, incremental advancement and confirmatory studies; analytic accuracy; and passion for the research projects.[2]

The majority of the identified studies on research and publication productivity have demonstrated an association with the proposed factors in Kern's model. For this reason the evidence for research productivity has been presented based on the components of Kern's research productivity model.

### Funding of research

Grant funding has been associated with improved research productivity.[3-5] This association appears to correlate with the number of successful grant applications and the financial value of the grants.[6]

### The quality of the investigators

A number of factors have been associated with the research productivity of individuals. It has been shown that the most productive individuals have associated academic duties and protected research time.[4] The degree of productivity correlates with the amount of time that is allocated for research.[4,7] Conversely, an increasing clinical workload has either a nonsignificant[8] or significant negative correlation with research productivity.[9]

Participation by investigators in clinical trials has also been associated with increased productivity.[4] Clinical trial participation probably entrenches the principles of sound study methodology and execution, while simultaneously enhancing capacity through the establishment of a local organised research office and dedicated research personnel at the institution where the research is being undertaken.

Productivity is also associated with service to journals, grant review panels[8] and personal involvement by senior academic staff in the research.[7]

A habit of daily writing by junior staff has been associated with increased publication productivity.[10] While it is impractical to expect a habit of daily writing in a service-related industry such as anaesthesiology, the principle of exposure to academic writing remains important. It is recommended that junior staff members, with the support of more senior academic personnel, should be encouraged to increase their participation in journal correspondence. This may start a culture of critical appraisal and a communication of these ideas.

### The efficiency of the institution

Increased institutional efficiency is associated with increased research productivity. It has been demonstrated that large clinical training programmes link to this.[3] The addition of further fellowship training programmes or "fellows" also increases research productivity.[3,8]

The quality of the staff who run these programmes determines productivity. Staff members who have postgraduate degrees are more productive.[4,8] When staff of this calibre are not available, strategic staff recruitment can increase and maintain research productivity.[11] Furthermore, if academic advancement is linked to scholarship, then further productivity has been observed.[7]

### The research mix of the research programme

Kern recommends that research should include a mix of "novelty", "incremental advancement" and "confirmatory studies".[2] While this concept is not specifically addressed in the literature, it is indirectly supported by the fact that modification of an initial research plan in response to technical or other research difficulties (as opposed to new scientific opportunities), is associated with decreased productivity.[12] In other words, a focus on scientific endeavour is most likely to ensure productive success.

### Analytic accuracy

Sound publishable research requires good research practice. This is probably encapsulated in Kern's component of "analytic accuracy".[2] My own understanding of rigorous research methodology and execution has evolved through participation in international clinical trials. Certainly, this may be the reason, in part, why participation in clinical trials is associated with increased research productivity[4] as it teaches habits that are ultimately associated with high-quality research. This links to an improved ability to ensure publication.

### Passion for the research projects

Although there was limited literature on this component of the model, one study of "academic" doctors identified

that "poor personal motivation" was a barrier to multi-institutional research.[13]

### Factors that are not associated with research productivity

It is also important to consider factors that have not been associated with research productivity as these should not be considered to be necessary criteria for a successful research model in South Africa.

Firstly, geographical location does not appear to be associated with research productivity.[3] This is an important observation as it suggests that a successful research programme should be feasible in any department in South Africa, independent of its position. It is suggested that, since the publication of the Kern study, it is likely that geographical location has become even less important as a result of improved web-based communication.

Secondly, apart from the administrative duties of a departmental chair or vice-chair, those of other staff have not been shown to impact negatively on research productivity.[8] Therefore, it is possible that individuals below the level of departmental chair or vice-chair should be able to contribute positively to research productivity.

### Conclusion of the associations with research productivity

Based on the current literature, the factors identified in Kern's model[2] appear to be valid predictors of a successful research programme. Therefore, it would be reasonable to propose a model for South African anaesthesiology research, based on these six components. To realise the full benefit of a research programme based on this model, it is important to understand that the components are multiplicative, and not additive. Therefore, if there is a deficiency in one of these areas, the success of the whole research programme will always be compromised, regardless of the strength of the other components. Thus, to ensure research success, it is essential that all of the components in Kern's model are addressed.

## A proposal for a research model for South Africa: a 'South African virtual perioperative research institute'

It is proposed that a virtual national perioperative research institute is established, and that all departmental research boundaries are abandoned. It is important to adopt a national collaborative research effort. While people commonly think of a research institute as a physical structure, the entire South African anaesthesiology community could be considered to be a virtual research institute, especially as physical proximity is not a necessary prerequisite for research success.[3] The objective of collaboration would be to ensure that, as a group, all the components of Kern's model are fulfilled for research success[2] through national resource sharing, especially in areas where individual departments have identifiable deficiencies.

The function of a virtual perioperative research institute would be to coordinate anaesthesiology research in South Africa. The precedent for such a proposal has already been set in the UK, where the National Institute for Academic Anaesthesia was created, with the primary objective of coordinating and implementing an academic research strategy.[14]

Every anaesthesiology department in the country would need to agree upon core research themes and a departmental research agenda for its site. This should be followed by the establishment of a national collaborative research coordination committee. This committee would comprise a group of active and passionate researchers from around the country, with representation from all the anaesthesiology departments. Its function would be to agree upon and establish core research themes for the country. It should establish immediate and intermediate-term research objectives and projects to ensure that adequate progress is made within core research themes. Essentially, each core research theme would then link to an intermediate-term research plan which would constitute and accommodate a number of predetermined projects.

The national collaborative research coordination committee could fulfil a dual function of ensuring that the research interests of each department and its staff are protected, while simultaneously understanding the potential of national collaborative research, and ensuring that this objective is realised. Full transparency in this process would be required. This committee would be responsible for ensuring that individuals with the necessary skills, research agendas and project desires were appropriately aligned between departments.

### The potential benefit of establishing appropriate core research themes

An established research agenda for each core theme would provide an infrastructure for meaningful research, which could simultaneously support numerous registrar research Master's projects. It is envisaged that the core themes would be appropriately planned so that they would provide the structure that is necessary to systematically address important core anaesthesiology research themes that have national and international relevance. It is possible that a specific core research theme may run predominantly from a single department, or in other cases, across a number of departments.

## Necessary considerations to ensure that collaborative research in South Africa improves research productivity

Creating a virtual institute will create collaborative research, while simultaneously ensuring that all the components that are necessary for productive research are fulfilled.

### Funding of research

In order to ensure adequate funding of anaesthetic research, it is important to develop various processes simultaneously.

These include creating increased public awareness of perioperative morbidity, participation in the committees and processes that drive the goals of the ASSAf report and the National Health Research Committee, ensuring that eligible anaesthesiology researchers achieve NRF ratings, and establishing dedicated grant writing.

The first objective should be to increase public awareness of the burden of perioperative morbidity in South Africa, if a more equitable allocation of research funds is to be realised. This has started on a global scale[15] and now needs to be refined for the South African population. These data suggest that the burden of noncommunicable diseases (cardiovascular and cancer) presents a massive public health burden. This is certainly applicable to South Africa. In this country, although the proportion of noncommunicable diseases is decreasing, secondary to the increase in human immunodeficiency virus (HIV), the incidence of noncommunicable diseases is increasing and so is the burden.[16] Furthermore, despite the fall in the life expectancy of South Africans, again secondary to HIV, the population over 60 years of age is expected to increase by 189% between 1985 and 2025, with an associated doubling of cardiovascular disease mortality by 2040.[16] In addition, the expected increased efficacy in the treatment of HIV should lead to an increase in longevity and a further increase in noncommunicable diseases.[16]

The important role that anaesthesiology plays in ensuring maternal health needs to be publicised more widely. It is unacceptable that a document as important as the *Fourth report on confidential enquiries into maternal deaths* was only available on the website of the Department of Health.[17] It is imperative that such data are presented to all South African medical professionals through commonly read journals. I believe that public awareness campaigns would have a positive impact on the allocation of research funding for anaesthesiology.

Furthermore, it is essential that anaesthesiologists play a more proactive role in the ASSAf research agenda[1] and the National Health Research Committee[18] to ensure that the agenda of perioperative research is prioritised within these influential research bodies.

All eligible researchers should be encouraged to apply for NRF rating. This would result in an annual stipend for research activity being granted to certain individuals. Grant writing is not an established culture in the South African anaesthesiology research community. This has limited both the scope and nature of the research in which we have participated. Therefore, it is recommended that the establishment of central funding for a national grant writer for the 'South African virtual perioperative research institute' should be encouraged. National collaboration would also increase the strength of the research grant applications.

### The quality of the investigators

National collaboration should be seen as a strategic faculty recruitment element to ensure that personnel who fulfil productivity-associated criteria are available to mentor and lead anaesthesiology research in South Africa. Therefore, it is possible that through the creation of a virtual institute, experts with postgraduate degrees would effectively be recruited into each national core research theme, which would increase research productivity.[11] Collaboration would ensure that more registrars were mentored by researchers who are active within their field of research interest, and hence more likely to safeguard research productivity.[13] In addition, it is possible that core research theme coordinators could develop their careers by structuring a doctorate based on the theme.

It is well documented that research often ends in an impasse when appropriate supervision is lacking. The provision of appropriate mentors could help to focus attention on a solution to the research problem.[19] This would be particularly important if registrars had an interest in a research theme that was not commonly undertaken at their institution. Through the development of core research themes, it would be possible for individuals to be involved in meaningful research through another university that was directing the appropriate core research agenda. This would prevent the ultimately wasteful practice of small, meaningless projects that are commonly undertaken when research is required (as for the specialist registration), but with no mentor, vision or interest existing within the department for that particular field.

Furthermore, the creation of an organised research agenda within each core research theme might mean that an environment could be developed within which research fellowships could be offered in the future.

A further reason for anaesthesiologists to play a more proactive role within the ASSAf and national health research committees would be to ensure that other factors necessary to improve and sustain the quality of investigators were addressed at a governmental level. While these groups have engaged government in an important national research dialogue and have ensured that its leaders are committed to certain research priorities within the next 3-5 years,[18] a key issue that has not been raised is the lack of incentives for researchers within state employment. Currently, the vast majority of anaesthetic staff are employed by the province where the allocation of time for research work is limited and incentives for research productivity minimal. The only incentive that is currently available is the award of titles to professorial level, albeit without any financial advancement. Previously, academic promotion to associate or full professor was accompanied by an equivalent promotion awarded by the provincial government, and hence a concomitant financial incentive. It is imperative that the linking of academic and provincial promotions is once again placed on the governmental agenda.

### The efficiency of the institution

The adoption of this model would result in a better allocation of resources and resource utilisation. It should

be possible to identify specific areas of clinical strength within each department. This may be by virtue of personnel who have specific skills that are necessary for successful research within a specific field, and/or departments that have system strengths to facilitate clinical trials in these fields. It is possible that some of the identified strengths in certain departments may contribute to a wide range of core research themes across the country, e.g. departments with active laboratory-based research.

A virtual institute will ensure institutional efficiency by avoiding the unnecessary replication of scarce resources, the majority of which are personnel-based. Sharing some of these scarce resources nationally may virtually increase departments' research faculties. Examples include statistical expertise, grant writing and skilled laboratory research assistants.

It is also important that all anaesthesiology posts, whether held by a university or the Department of Health, should include protected research time for key research personnel.[4,7] Furthermore, key individuals in a core research theme could create an environment in which group supervision may be viable.

### The research mix of the research programme

It would be encouraging if the agenda within each core research theme included a mix of "novel", "incremental" (to enhance current knowledge) and "confirmatory" research.[2] A balance of clinical and clinically applicable basic science laboratory work should be supported.

The creation of a core research theme and an environment for the supervision of a number of Master's students, with the intention of answering a specific clinical problem within a theme, should be seen as potentially eligible for a doctorate for the overall supervisor of the core research theme. South African universities should be lobbied to consider principal individuals who develop and drive a core research theme programme to be eligible for a doctoral degree submission. These individuals would drive a full research agenda towards a final objective, while supervising or facilitating the planned postgraduate projects necessary to achieve this goal. Eventually, they would fulfil a joint function of multiple senior authorships and undertake the supervision of a number of clinically related projects.

Besides established research themes, anaesthesiology and perioperative medicine in South Africa could provide a number of potentially unique core research themes. These may include a national audit of perioperative outcomes in a sub-Saharan African country, the effect of communicative or infective diseases on perioperative outcomes, trauma management and outcomes, and the relationship between health services and perioperative outcomes, including patient access to medical care, type of staffing and available resources. Based on the findings of the *Fourth report on confidential enquiries into maternal deaths in South Africa,*[17] there is certainly a need for a national confidential enquiry into perioperative deaths, such as that which is run in the UK.

On a broader scale, one of the unique core research themes should focus on the public health implications of perioperative outcomes.[15,20] It is important that this group communicates the public health implications of anaesthesia and surgically related outcomes to the public. This should be framed within the South African context. This group may have a vital role to play in ensuring the increased allocation of funding for anaesthesiology in South Africa. Collaboration with bodies such as the Department of Science and Technology (South Africa) and the South African Centre for Epidemiological Modelling and Analysis to model the public health implications of perioperative outcomes should be encouraged.[21]

Establishing a research track record for every researcher would also increase the number of individuals who are eligible for a NRF rating, and hence ensure further funding.

### Analytical accuracy

Senior academics with clinical trial experience should be allocated to each core research theme to ensure appropriate guidance for analytic accuracy.[4]

### Passion for the research projects

Collaboration between South African anaesthetic departments would be a virtual expansion of the registrar programme, particularly within each subspeciality of anaesthesiology. Therefore, this would increase research productivity.[3] It would then be possible to improve academic productivity by directing registrars towards the groups undertaking the research within their field of interest. This would improve the registrars' and the supervisors' motivation or passion for these projects.[13]

There have been success stories on how the planned development of a research infrastructure, the creation of a research culture, the development of a research faculty and the tackling of obstacles to research productivity have resulted in highly funded, successful research proposals.[22] One example is the Australian and New Zealand Intensive Care Society Clinical Trials Group (ANZICS-CTG), which has established excellent, highly cooperative, cross-institutional research programmes that have led to important trials, such as the Saline Albumin Fluid Evaluation (SAFE) trial and Crystalloid Versus Hydroxyethyl Starch Trial (CHEST).[23,24] My proposal is not that dissimilar to the programme revitalisation described by Conn et al[22] and the establishment of the ANZICS-CTG. If implemented correctly, it could achieve similar successes.

## The cost of not adopting a 'South African virtual perioperative research institute' model

Without a 'South African virtual perioperative research institute', research in South Africa would remain uncoordinated. It is likely that this would continue to place excessive demand on limited resources. This would lead to inadequately resourced, suitable personnel having to

cope with excessive time constraints. Individuals running research projects would need support that is unsustainable. The cost would be staff burnout and the inability to establish an appropriate, recognised research track record. Unfortunately, this would result in a vicious cycle. The consequence of staff shortages would be a lack of capacity to fulfil research requirements. Further staff losses would ensue. Staff shortages in clinical services are known to be associated with a departure from academic medicine and emigration.[25] By comparison, successful research leads to staff retention and collaboration with external partners. The retention of staff in postgraduate training programmes leads to university staff retention. If doctors need to train abroad, the loss of doctors from the country would increase.[25]

## How to handle small research projects which fall outside the established core research themes

Individuals who show an interest in developing research outside of the core research areas should still be supported. It is possible that those who have the desire to follow their own research agenda, despite the presence of established research programmes, could be identified as potential research leaders with a genuine passion to drive a new core theme in the future.

This proposal should be seen as one that improves research infrastructure through coordinated research themes so that important, relevant research can be conducted. It is a response to preventing a situation in which numerous small, unnecessary and futile research projects are carried out by individuals who genuinely do not have an interest in the type of research in which they are involved, but are only participating in it because it is a regulatory requirement. It is far more desirable for these smaller projects to be part of a greater good.

## Conclusion

South African anaesthesiology finds itself at a crossroads where the necessity for increased clinical research is conducive to the establishment of a collaborative research programme. The creation of a 'South African virtual perioperative research institute' could be a viable solution. Based on the success of this venture, other stakeholders in clinical anaesthesiology research in South Africa could be lobbied by a 'South African virtual perioperative research institute'. Ultimately, the goal should be collective responsibility for national research by government, academic and commercial partners in South Africa.

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