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Not everyone is a mechanic: Research and the Registrar

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HPCSA REQUIREMENTS

Registrar training has evolved.
In January 2010 the Health Professions Council of South Africa's (HPCSA) Medical Subcommittee for Postgraduate Education and Training published new requirements for specialist registration.[1] The requirements included the completion of a research project, resulting in publication or a successfully examined dissertation. [1] This initially arose as a result of the lack of uniformity amongst specialist training programs with regards to syllabus and assessments, specifically research knowledge and skills. This led to the new defined requirements for specialist registration. [13]

The HPCSA did not prescribe the nature or the types of research to be undertaken, other than making the following statements:

"All specialist trainees will be required to complete a relevant research study, under the supervision of the Head of Department or nominee".[1]

"The assessment criteria of the research study would be that appropriate theoretical knowledge is demonstrated; a research protocol is compiled according to required norms; and a progress report on the research project is given on a regular basis"[1]

"Research results should be reported in a format of a dissertation according to acceptable scientific norms; The research study, which will be assessed at university level, and may be used as a credit for Part III of the MMed degree".[1]

Therefore, as of January 2011, all specialist trainees registered with the various Colleges of Medicine of South Africa [CMSA] have had to fulfil the above research requirement. This would be in addition to clinical specialist training in an approved centre, the production of a satisfactory portfolio of clinical casework, and successful completion of the CMSA exams in order to be awarded a MMED degree at university level. [1,13]

THE STAKEHOLDERS

There are currently four shareholders holding a stake in registrar training: [13]

1. The National Department of Health (NDoH)
    * They serve as the full-time employee of the registrar
2. Health Professions Council of South Africa (HPCSA)
    * They control specialist registration
3. Colleges of Medicine of South Africa (CMSA)
    * They preside as the uniform body controlling the exit examination
4. The Universities
    * They register Registrars as students for the MMED degree

The new research regulations facilitate the National Department of Health's goal of increasing relevant research. [13] Proof of research competency is required by the HPCSA for registration, and by the CMSA for examination qualification. [13] However, it is ultimately the various universities that manage the acquisition of the research competency skills, facilitate the research and provide supervision.

The research component is assessed at individual university level as opposed to the single exit examination, which is under the CMSA's jurisdiction.[13] This is ironic, since one of the main aims of introducing the research requirement was to introduce a more uniform examining process amongst registrars.

Let us not forget that the registrar is a stakeholder as well, and this new requirement incurred backlash from them. The MMED requirement by the HPCSA for specialist registration was legally challenged in 2015 by a group of registrars who had failed to meet the research requirements.[2] Their challenge was upheld in court. The judge ruled that the complainants be registered as specialists, as they had successfully completed their specialist examinations. They were also granted and additional 2 years to complete the research component. They would be removed from the specialist register if they failed to successfully complete it.[2]

THE SOUTH AFRICAN RESPONSE

Is the HPCSA requirements for a research dissertation for specialist registration the best option?

In this editorial Biccard and co-authors pointed out that as a result of the new HPCSA registration requirements, they believed that the volume of underpowered journal submissions would increase. [4] According to them, registrar driven research lends itself to small studies that can be performed quickly, and as a result many are inadequately powered. This often produces clinical research that is not beneficial or incorrect. [4]

They also highlighted the fact that the undergraduate curricula places little weight on evidence-based medicine, nor does it include research methodology. This only adds to the dilemma registrars are now faced with. They are now required to fit a research project into their overburdened curriculum and demanding clinical load, on the background of a research knowledge deficit . [4]

They concluded by commending the addition of a clinical research component to training but urged for reconsideration of the training objectives.

Polluting the well

The above views were supported in a response editorial by Rodseth, Bishop and Wise titled: “Polluting the well” [3]

Here they pointed out that South Africa’s attempt to train specialists to critically engage with scientific literature (while ensuring that the research conducted is robust, reliable and clinically significant) has resulted in registrars, many of whom have no affinity or interest in research, attempting to fulfil their research requirements by publishing underpowered surveys, audits or small observational studies.[3] As a result of this, there has been incessant stream ‘inconclusive’ and ‘irrelevant’ research that has undermined research reliability and polluted the research well.[3]

They concluded in saying that the current system was failing to achieve its training goals, damaging the quality of South African research, polluting the research pool in addition to monopolising the time of specialists with a desire to develop meaningful research programmes. They proposed that the research component for registrar training be revised.[3]

Response to concerns expressed in the journal regarding the HPCSA requirement for registrar (MMed) research

These strong arguments were met with equally persuasive counterarguments by Rout, Aldous and Hift in their response editorial. They emphasized that the purpose of introducing a research component was to fulfil an educational need not a research need.[5] As well as point out that the research requirement was never intended to result in a publication, but rather to produce a demonstrable understanding of the research process in the form of a practical document. [5]

Both Biccard and co-authors and Rodseth and co-authors call for an alternative to the practical research project as a means of assessing research knowledge, yet Rout and co-authors argued that it is precisely through the practical application via a dissertation or publication that the learning of the research skill is best assessed. [3,4,5] They did agree with the call by both previous publications for national discussion to address the issues raised.

So there are issues with the enforced research component for Registrars, but we would be naïve to assume that the issues arise solely from “Registrars whom have no affinity or interest in research, attempting to fulfil their research requirements by publishing underpowered surveys, audits or small observational studies.”[3]

All papers raise valid points and highlight the need for restructuring the design of the research component. Registrar research may be polluting the well, but the problem is much bigger than we realise, in that the well was already poisoned to begin with!

This is supported by both Biccard et al and Rout et al as they point out that problems of small studies, predatory journals, and submission of “non-useful” or “non-meaningful” research to journals are problems not unique to Registrar research, because they already exist. [4,5]

PROBLEMS WITH RESEARCH

Research is plagued with the following problems:

a) Bad quality research
    i) Poorly planned research
    ii) Poor supervision
    iii) Poor quality
b) Skewed scientific hierarchy
c) Research Fraud
d) Trivial Research
e) Financial incentives
f) Publish or Perish
g) Predatory journal

Bad quality research

Poor planning

A great example exploring this is a recent study by Nontshe et al, which examined sample size calculations and their adherence in RCTs which was published in the top 5 anaesthetic journals for 2014. In particular, it sought to determine treatment effect estimations used in a priori sample-size calculations and compare them with actual treatment effects. [6]

Of the final 28 articles analysed, the relative difference between expected and actual event rates was greater than 20% in 80% of trials and greater than 50% in 44% of trials.[6]

Why is this important to us?

Sample-size calculations are critical to ensure that randomised control trials return robust and reliable results. The estimated treatment effects used in these calculations is often significantly different from the actual treatment effect, and this can significantly impact the trials validity.

The study concluded that unrealistic assumptions of treatment effects in randomised controlled trials published in anaesthesia journals were common. Trial sample sizes should be calculated realistically and be fully reported in both trial protocols and publications. In addition, where possible researchers should collaborate to achieve meaningful trial sample sizes.[6]

What this study shows us is that randomised control trials are difficult to perform, but also the trials that are influencing our practice, are based on flawed science. This is also a good example of high-quality research produced by registrars, which adds support to Rout and co-authors argument that good quality research can come out of these requirements.

Poor Supervision

In order to produce research, adequate supervision is a needed.
Supervisor qualifications include the following: [17]

• A qualification in a relevant field of study higher than, or at the same level as the exit level of the postgraduate programme he/she is supervising.

• An appropriate research track record, including experience, expertise and peer recognition in the field of study.

•Regarding inexperienced or new supervisors, there is ongoing staff development and support, and joint supervision is explored as an option.

Keep in mind the MMED criteria was introduced into practice only after 2011, and supervisors are ideally required to have some experience in this process. Factoring in other specialist duties including clinical, administrative and managerial tasks, the end result is a very limited pool of available supervisors.

There is a need for approximately 90 new clinical research projects in Anaesthesia annually to match the Registrar intake. [4] This is only in one specialty. Consider all the specialities impacted by the HPCSA ruling. This translates into a large academic burden on the university departments to ensure these projects are scientifically complete and clinically valuable. Biccard and co-authors expressed their concerns as to whether or not producing this volume of clinically relevant research was even feasible. [4]

Rodseth et al raised the issue that these requirements were dragging overburdened supervisors away from meaningful intensive research and longer-term projects, and had some of them pursuing the short-term lure of publishing high-volume low-quality research with the end goal of:

- increasing research productivity
- Increasing personal gains (financially and academically)
- Hindering real knowledge progression. [3]

In addition to this there have been significant increases in the numbers of Undergraduate and Postgraduate Students, without a similar increase in the number of academic or clinical staff. This has led to increased time and effort demands on experienced and qualified researchers, at the expense of their own post-doctoral work, compounding the situation further. [5]

Poor quality

Poorly planned research, pushing out of smaller, single centre studies and poor supervision often lead to unreliable data lacking robustness. On its own a small, single centre study may not seem harmful, but the problem lies in when they are all pooled together in a metanalysis or systematic review. A meta-analysis carries significant scientific weight and when all similar data is pooled together the quality of the research may be masked, but the impact is not.

This is best highlighted by the systematic review done by KER, Shakur and Roberts on Tranexamic acid (TXA) and Post-Partum Haemorrhage (PPH). [7] They set out to conduct a systematic review of all RCTs to assess the effects of TXA on the risk of PPH and other clinical outcomes. Selection criteria included all Randomised controlled trials comparing TXA with no TXA or placebo in women giving birth vaginally or by caesarean section. However, they were unable to complete the meta-analysis owing to data concerns.

They found 26 trials including a total of 4191 women, but examination of the trial reports raised questions about the quality of the data. Eight reports contained sections of identical or near similar text despite claiming to be different trials, and there were important data irregularities in several trials. Other errors were uncovered, and the authors were contacted and asked to provide more information regarding their trial processes, including the dates when the first and last patients

were randomised, a copy of the ethics committee approval and the anonymised individual patient data. [7]

They received responses for 13 trials (50%) . Some of responses included:

(1) One author who declined to provide the information
(2) Ethics approval copies of only ten trials
(3) Two trials had no ethics approval
(4) Only seven trials sent patient data.

One author of two trials explained that he was unable to send the data due to the theft of the laptop on which the data for both trials were stored. Randomisation was inadequate in many trials after a meta- analysis of the baseline variables was done, and blinding was unclear in two trials.[7]

This amongst other inconsistencies all led Ker, Shakur and Roberts to conclude that there is no reliable evidence that Tranexamic acid prevents Postpartum Haemorrhage during childbirth. Many of the trials conducted to date are small, low quality and contain serious flaws.[7]
It also showcased the poor quality of trial research in this area, and calls into question evidence-based medicine, when the evidence itself is dubious or constructed around poor quality trial data.

Skewed Hierarchy

Evidence hierarchies reflect the relative authority of various types of biomedical research which create levels of evidence. There is broad agreement on the relative strength of the principal types of epidemiological studies but no single, universally accepted hierarchy of evidence. Randomized controlled trials (RCTs) rank above observational studies, while expert opinion and anecdotal experience are ranked at the bottom.

Some evidence hierarchies place systematic reviews and meta-analysis above RCTs. However, a study design higher in the hierarchy does not necessarily mean the study is better than others, and a study lower down the hierarchy does not mean the results are not valuable.

The meta-analysis done on Tranexamic Acid calls to light the natural tendency, or assumption we have to think that the RCT is king. It highlights the need to reconsider the scientific hierarchy of evidence and why even a low-quality meta-analysis and RCT are considered far superior to an excellent, high quality qualitative survey?

Research Fraud

Many academics have questioned the large number of published studies that cannot be replicated by others – the very heart of validity in experimental science.[12] In Richard Hortons article *What is the Medicine's 5 stigma* he claims, "The case against science is straightforward: much of the scientific literature, perhaps half, may simply be untrue. "[8]

Research fraud is prevalent in our society today. A review of the 2,047 retractions listed in PubMed as of May 2012 found that 67.4% were attributable to misconduct. This included fraud or suspected fraud (43.4%), duplicate publication (14.2%) and plagiarism (9.8%). [9] This may not necessarily prove that the incidence of retractions is increasing, but rather that editors and researchers are getting better at identifying and removing papers that are fraudulent or false. What it does suggest is that the review process to identify this fraud is inadequate.

Some notable examples of "untrue "scientific literature include:

1. Andrew Wakefield, author of the Lancet paper linking Autism to MMR. He had a flagrant conflict of interest in that he received money from a lawyer looking for a vaccine link. He was highly selective in his reporting of data and had unethical dealings with children. He was guilty of issues with consent, exploitation, conduct of a clinical trial and financial conflict of interest. [18]

2. William Summerlin. He was researching ways to overcome tissue rejection at Sloan-Kettering Institute in New York. His research included transplanting fur from black mice onto white mice. His fraud was uncovered when it was discovered that the "transplanted" patches were drawn on with a marker pen, and easily removable with alcohol.[18]

Is there a culture of fraud developing? In 2012 the British Medical Journal conducted a survey of more than 2,700 researchers. They found that 13% admitted to knowledge of colleagues "inappropriately adjusting, excluding, altering or fabricating data" for the purpose of publication. [9]

A good question is: Why? Why are researchers tempted to fake results? The temptation for researchers to falsify their results can take many forms. It can be to advance ones' career, a financial incentive, a product of narcissism or over-commitment to ambition. [9]
Another major reason can be tremendous pressure in the academic system to publish in high-impact journals. These high-impact journals demand innovative and surprising results. [10] Ultimately the common outcome of most motives is intellectual dishonesty.

Trivial Research

A lot of research is trivial and of little or no social worth. [12] This is most prominent in the Social Sciences and Humanities. An English professor at Emory (Mark Bauerlein) once calculated that over 20,000 scholarly papers had been written on Shakespeare over a period of roughly two decades. This is an average of one every eight hours. [12] How much can one really say about Shakespeare?

Academia is an industry that deliberately promotes overproduction, irrespective of markets, outlets or consumers. Majority of submissions are rejected by the top international journals, and of those published, many might not find a viable readership and are rarely cited. [16] As Bauerlein noted - a large portion of papers published in literary journals are seldom if ever cited. [12]

This is a result of the Law of Diminishing returns – where at some point large numbers of additional studies on a single topic likely to be a waste. [12] Overproduction serves to overburden editors and reviewers, waste resources, results in fewer citations and reduces focus on educational activities. [16] The final result is the average academic producing many worthless articles over their career rather than a few valuable articles. [16]

It asks the question of fair proportion and resources. If the topic is unlikely to yield any new insights or change any practice after being confirmed numerous times, what is the benefit of researching it extensively?

Financial Incentives

In South Africa, academics and their institutions receive substantial incentives for publishing in certain journals that compromise the "DHET – accredited list". [11,16] In some situations this includes receiving a proportion of the government incentive in cash. For every journal article, conference proceeding or book published, the DHET provides a financial subsidy as a way of distributing government funding to public universities. The government incentive translates into roughly R120,000 per "unit" published. One unit equates to a peer-reviewed, accredited journal article or book chapter by one author, and this is then divided by the number of authors. [11] Incentive payments for publication in journals is also unique to South Africa. [16]

The intention behind the monetary incentive is good. It was designed to encourage the production of more peer-reviewed research by South African academics, and improve the extent and quality of the country's academic research.[11] The benefit of this DHET incentive mechanism has meaningfully increased publication output and amplified productivity, through encouraging more academics to participate in research and publication.[16]

However, such a system has created incentives to publish in accredited journals with the lowest quality requirements. This is because the incentive does not consider the quality of the journal or the citation impact. It remains the same whether you publish an excellent paper in a top journal after many years of research, or get a weak paper based on minimal research published in a local journal.[11,15] Completed research that contributes towards awarded master's degrees does translate into much-needed revenue for universities. This system has also driven many universities to engage as "rent-seekers" or pursue perverse incentives and has led to the development of unethical arrangements between institutions, individuals, and publishers. [16]

"Rent-seeking" in short is an economic concept where organisations or individuals seek to increase wealth without the reciprocal contribution of productivity. It typically revolves around government funded programs. In this scenario it allows academics to utilise government resources to obtain actions from state institutions that permit them to earn 'rents' in excess of what they would earn in the hypothetical scenario of a competitive market. [16]

DHET subsidy income is also determined by the proportion of an institution's authors on any publication. The more the number of collaborators outside the institution, the lower the revenue for that paper. This means that the DHET inadvertently penalises collaboration.[15]

The Research Outputs Policy published by the Department of Higher Education & Training in 2015 attempted to address this by pleading that "*Institutions and academics must remember the importance of research integrity when submitting their claims".* But it is ironic to make an appeal based on academic integrity, when the need for an incentive was based on lack of academic integrity and interest in the first place. [11]

Publish or Perish

The large rewards given for academic research has frequently led to a 'publish or perish" environment. Brilliant teachers, who are mediocre researchers are pressured to publish forgettable articles in obscure journals for the purpose of tenure. Not only does this serve to add to "publication pollution", but also drags them out of the teaching arena where they excel and denies students more interaction time with them.[12]

Predatory journals

There are an escalating number of predatory, open-access journals that publish dubious research often without peer-review. [4] In Rout and co-authors response they argued that “polluting the publication well” was entirely under the control of journal editors. This is because registrar research is subject to final peer review, requires supervision by an experienced researcher as well as preliminary post-graduate and ethical review by university bodies. This should ultimately result in good quality of research. Essentially if “non-meaningful “and “non-useful” research is being published, it would be because the journal editors license it.[5]

The term ‘predatory journal’ was coined by Jeffrey Beall. Predatory publishing refers to a exploitative, academic publishing business model that charges publications fees to authors , neither actually checking articles for quality and legitimacy, nor providing the other editorial and publishing services associated with legitimate journals. The concept that they are "predatory" is due to the view that academics are tricked into publishing with them.

Despite increased attention in the literature and educational campaigns, the number of predatory journals and volume of articles they publish continue to increase.[14] One of the contributing issues is that there is no clear definition of what a predatory journal is, nor a delineation of their characteristics. Beall defined them as outlets “which publish counterfeit journals to exploit the open-access model in which the author pays” and publishers that were “dishonest and lack transparency”. [14]

A review article by Cobey et al was done to better quantify the poorly defined characteristics and description of predatory journals. [14]

- Predatory journal operations were described as being deceptive or lacking transparency, demonstrating poor quality standards, demonstrating unethical research or publication practices and using persuasive language.
- The most common characteristics of the journal operations category were:
    - Low levels of transparency and integrity
    - Poor quality practices of journal operations
    - Contact details of publisher absent or not easily verified
    - Journals are published predominantly by authors from specific countries

As Biccard et al put it: medical literature is flawed, because society rewards shoddy science.[4] The pursuit of novelty is at the forefront, and very few journals would publish negative results or a question being asked a second time. Combatting predatory journals requires the upskilling of professionals who use them to be more discerning and to place greater value on research which confirms prior work done. Afterall reproducibility is the cornerstone of science. [4]

NOT ALL DOCTORS ARE RESEARCHERS

Not all doctors were made to be researchers, some excel clinically and administratively. Some excel managerially. Not all doctors make good researchers, and it is unrealistic to expect it, or to hold them to the same standard as well-established researchers.

But that does mean that research should be isolated and restricted only to a select few? No.
It is a valid and reasonable progression to ensure that all specialists are able to critically evaluate scientific literature. But how best do we achieve this? And furthermore, the question should be - how do we assess this?

CURRENT ISSUES

The current system in place is flawed and has several issues. These can be broadly categorised into ethical issues, non-uniformity of standards, lack of transparency, lack of resources, time burden, the registrar's role, pragmatism and legal implications.

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Ethical Issues

By implementing compulsory research, the student is forced into the vulnerable position of a power relationship with the supervisor and even at times the head of department. This may create an environment of exploitation. It lends itself to a situation where students can be directed to a particular research project that best serves the senior researcher's publication objectives and may provide a form of cheap labour for them. [5]

Non-uniformity of standards

The aim of the HPCSA was to introduce compulsory registrar research, and a single examining body. The purpose of this examining body was to ensure uniformity of postgraduate examination standards across all the medical schools of South Africa. By leaving the execution of the research component up to the individual universities, this aim has landed slightly off target. The end target of the research component is poorly defined and lends itself to various interpretations according to the individual universities, which defeats the purpose of cross-country uniform standards.

Lack of transparency

The current requirements are too vague. At the moment there are no clear guidelines or end result that students may aim for, there is no syllabi, past papers or peer comparison as with a written component.[5] More clarity is required on what exactly entails the Research Component, and when is it considered completed?

Lack of Resources

Limited human resources have proven to be a particular problem in those institutions with no history of obligatory registrar research. There are few supervisors with experience available. The demands of medical, clinical and administrative duties of the supervisors must be factored in as well. As previously mentioned, the growing number of undergrad and post graduate students without an increase in academic staff compounds this problem. [4,5] The question needs to be raised regarding what financial and clinical resources are being invested into these new demands?

Time burden

The addition of a research component has led to the delaying of degrees beyond the required completion time. This delayed completion has a knock-on effect, delaying specialist careers and reducing the number of specialists available for appointment and impacting the health care system.[13] Should we be looking to extend the registrar program beyond the current 4 years?

The Registrars role

The balancing act performed by registrars should be given more recognition. Their role is unique in that they are registered university students who work in full-time jobs with overtime hours and are required to successfully deliver a Master's-level research project within a defined 4-year training period. They need to meet multiple demands of the employer, the university, the CMSA and the HPCSA. [13]

Pragmatism
A more pragmatic approach may need to be adopted. The current health system is overburdened, there is a shortage of medical doctors and significant financial constraints. There is also a dire need to train more doctors. This need however, needs to be balanced against the interests of academic institutions. The registrar training period has remained fixed at 4 years, while the medical knowledge base grows continually. Both interests need to be served, yet the noble intentions underlying the academic, clinical and research directive must be balanced against matters of practicality and service delivery. [13]

Legal implications
Given the outcome of the 2015 court case, where the specialists were registered and given a grace period of 2 years to complete their research, does the court of law make a determination on specialist registration requirements? And where does the final authority lie?

Problems with using publication as a criterion in graduate examination
Many registrars have interpreted the research requirement as being successful with an acceptance or publication of an article in an accredited journal, rather than focusing on a dissertation option. The practice of requiring publication in an accredited journal may lead to a lot of legal and ethical issues which include:

1. Editors, reviewers and publishers may be unaware that they are being involved in a formal examination process. Thus, they may be offering their unpaid labour and expertise in an assessment procedure they have not fully consented to, nor were employed to undertake.
2. A few journals dominate this part of the industry, their editors ensuring that they and their own students publish the majority of articles in these in-house but accredited journals.
3. Students are inundating accredited journals with submissions. This is done often with no direction on how to write for journal publication. As a consequence, journal costs to process these submissions are being stretched to capacity.
4. A submission might be accepted for publication by a journal whereas examiners may have failed the thesis, or vice versa.[16]

THE WAY FORWARD

There have been some excellent recommendations made such as the removal of incentives and enforcing the use of replicability statements in grant applications and research papers. A culture of collaboration and not competition should be emphasised. There also needs to be a larger focus on improving research training and mentorship. [8]

Recommendations from Biccard/ Dyer for a more practical South African approach include: [4]

1. The introduction of a national research educational programme to be structured as course work, with more emphasis on scientific discernment.
2. The programme should cover the principles of basic statistics, trial design, scientific writing, critical appraisal of published research and evidence-based medicine.
3. The establishment of large, meaningful, collaborative registrar research projects that allow for 'hands on 'experience.

The emphasis of training needs to be more weighted towards critical appraisals and to encourage more discernment

Proposals from Rout et al included: [5]

1. Multilateral arrangements amongst Universities, that each contribute examiners to a national pool, with equal input towards the work of examining candidate dissertations.
2. The work of the MMED students (either as dissertation of published paper) needs to be made available electronically, for all to access.
3. The encouragement of a regular exchange of ideas and experiences between institutions.

With regard to the current era of research fraud, Freckleton recommends the creation of an environment that allows for researchers' methodologies and properties to be challenged and the encouragement of journals to publish negative results including critiques and limitation analysis to help minimise the 'culture of fraud' [9]

CONCLUSION

Despite the different stances taken by authors on registrar research – their end goal is the same – ensuring quality research and training. It's just the roads they take to get there that differs.

Rout and co-authors promote the use of the research requirements practical application. Yet the production of a publication or dissertation does not necessarily prove the ability to scientifically discern and critically evaluate literature, which is the assumed end goal of this endeavour. Although abandoning the practical component entirely is not advised either. It would be akin to learning the K53 driver's manual but having no intention of actually driving a car.

The solution may come from the above proposals in the form of a research portfolio with specific theoretical and practical components. These would include examinable documents, tasks and defined end goals. This can ensure uniformity across universities, without overburdening individual supervisors or delaying degrees via prolonged time to publication acceptance. The roles and responsibilities of the relevant stakeholders also needs to be addressed, including what additional resources are being invested into this.

The problems of research fraud, abuse of incentives and predatory journals is a problem for the whole scientific community. It is this community that needs to take on the collective responsibility of the quality and robustness of research. The scientific community needs to guard research's integrity. Some ways this may take form is by educating themselves on statistics, reporting fraud, or refusing to entertain sensationalistic novel research.

Ultimately it can be best summarised as such: "The 2010 HPCSA requirement for registrar research has tremendous potential for the good, not only for the registrars but also the profession as a whole. However, this will only be achieved if we get our act together and make it work." [5]

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