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PERSONAL VIEW

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Research in Anaesthesia – The PEGASUS Journey

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I. INTRODUCTION

We never quite know how a scientific journey pans out, or any journey for that matter. What started for us as a scientific quest to better understand local clinical data and practice in cardiac surgery is yielding answers of value locally and beyond. But the high hanging (and greater) fruit that is already coming of age is the formation of a growing community of younger researchers who not only share success with us in publication, but beyond this are actively expanding the research community through their own networks in research and mentorship.

We knew not all patients do well with the same therapy. We started with our own local data. We aimed to follow a prospective cohort of cardiac surgical patients to understand genomics and outcomes after cardiac surgery, including that of acute kidney injury, atrial fibrillation and other outcomes. It was aptly named the mythological flying "Perioperative Genomics and Safety Outcomes Study (PEGASUS)", for many new initiatives have likewise taken flight. We have yet to fathom the heights and the reach that our young mentees will attain on this journey.

The typical patient presenting for cardiac surgery locally is a male in his 60s with 70% of this cohort expected to be hypertensive and about half are diabetics. Acute kidney injury (AKI) is the most common postoperative complication affecting 1 in 3 patients. 1% to 3% of patients with AKI have a new need for dialysis with a 25% mortality rate.

We asked these questions: 1) Who is at risk? 2) What puts them at risk? 3) Are the risk factors modifiable? 4) What was the perioperative effect, and did it also have a longer term but less appreciated impact? Our first publication addressed the first question (Chew, Mar, & Ti, 2013). While pondering the second, we were tasked to mentor a first-year medical student in research, our "index mentee". This was the catalyst for our journey in research mentorship. She answered the second question in her first manuscript describing anaemia as an important modifiable risk factor for AKI in our local population (Ng, Chew, Liu, Shen, & Ti, 2014). Subsequently we went on to publish a clinical risk score, and further examined the persistence of renal dysfunction and its link to end-stage renal disease (Chew, Ng, Liu, Chow, & Ti, 2017; Nah et al., 2016; Ng, Chew, Liu, & Ti, 2014). Her success was truly a shared success. Through word of mouth the research mentorship program expanded among the medical students. Our index mentee expanded her role; she turned student mentor. Through her, she helped other students to publish their first manuscript. With a growing base of students, we could simultaneously look at many other outcomes using the database. Concurrently publications have grown exponentially, shared and co-authored by these students, often as first authors. Our index mentee graduated from medical school, having already co-authored about 10 publications and also mentored other students in the program. Remarkably, as she starts her anaesthesiology residency, she has used her knowledge

of AKI to conduct an AKI Quality Improvement project for cardiac surgical patients.

We are privileged to have started with one mentee from which many others joined us on this incredible journey. We share below some of the lessons learnt.

II. PLANNING THE RESEARCH

A. Research Question and Literature Review

In any research, be it a database research or randomised controlled trial, the most important task is to define the research question. Students are guided on framing and defining the question. After brainstorming, students will do a comprehensive literature review. They need to identify relevant information, extract the useful information, gauge its accuracy, assess the authority behind the information and then synthesise all the information with the aim of clearly articulating the research question.

B. Introduction and Aim

By the end of the literature review, the student should be able to articulate very clearly the research question and state the aim of the project. The student should also put on paper the introductory remarks and the aim of the project.

C. Data Mining

Data mining of relevant variables follow naturally from the aim of the project. The student is guided through the statistical analysis of de-identified data. This will typically take a few months before the results are analysed and ready for presentation. At the end of this, the student will write up the methodology and results in the manuscript.

D. Manuscript Writing

This is the most challenging aspect and as mentors, we must resist the urge to take over the writing itself. Scientific writing is new to most students and they are guided line by line, paragraph by paragraph. This will typically take numerous revisions before it is completed and ready for presentation or publication. Mentees are not the only ones who have learnt, and we have too in understanding the ecosystem in creating and motivating a healthy team. We gladly share them with our mentees.

III. TRANSPARENT COMMUNICATION IS A FUNDAMENTAL CORNERSTONE

Research mentorship is a dynamic and unpredictable process and the roadmap as outlined above must be clearly communicated with the mentee. Time is the most valuable commodity for both mentor and mentee and we both need to respect this. Spending quality time is paramount for the success of the project and maintaining continuous communication with a mentee allows for immediate accountability. Apart from face to face meetings, communication is easily aided with modern technology. Google Docs is an online platform that allows us to share a specific folder which we can both access. We can upload articles and the mentor can easily monitor the progress of the manuscript. Manuscript revisions are automatically saved with a revision history as backup. We do this at our convenience from any location and this obviates the need for printing articles or sending countless emails and attachments.

IV. WE NEED DISCRETE GOALS

Goal setting creates structure and purpose and all students in the program are expected to present an abstract at a meeting and have a publication.

Mentors also act as coaches to fine-tune presentation skills of the mentees. Even deportment skills and life skills need to be imparted to the mentees in planning for presentations at conferences.

We are proud of students who have won awards for their presentations but it is equally important to continue to motivate those who did not win. Recently, we celebrated the remarkable success of one of our young mentees who as a first-year medical student beat other more senior doctors at an international conference to win the Best Oral Poster award.

V. WE BUILD THE COMMUNITY, NOT OURSELVES

From one index mentee, the research mentorship program has grown over the years. Students with more research experience are paired with younger ones and learn to be student mentors. We also link them to the larger research community by exposing them to overseas conferences. This is always an eye opener where they can feel the adrenaline rush of the most current research and learn how to establish networks and contacts. As mentors, it is important to identify the strengths and weaknesses not only of our students but also address our own shortcomings. Thus, when we lack the answers, we use our resources and networks to seek appropriate help. In this way, we demonstrate the willingness to always upgrade our own skills and understanding. We emphasise to the students that medical practitioners cannot work in isolation but collaboration is increasingly the way forward to solve many of the issues in medicine. We always involve students when we meet other collaborators so that they can learn and be mentored by other practitioners. One notable collaboration is with the Renal Registry to look at midterm outcomes. This

collaboration aptly demonstrates the need to seek cooperation and that anaesthesia as a discipline can contribute to better understanding of disease outcomes not only in the immediate perioperative period but beyond that of the hospital.

VI. ENSURE THAT REWARDS ARE EQUITABLE

One of the best ways to demonstrate the partnership between mentor and mentee is that of ensuring fair award of authorship credits. In most of the publications, mentees are given ownership and guided to their first publication. One of our mentees has remarked that: "It helps that medical students like me feel included in the research team. There is a sense that we're all equals". It is always an exhilarating experience for both mentors and mentees to see our work in print. This also empowers the mentee to do likewise for others in the research journey. In success, we build others up to succeed and only through such collaboration is the program sustainable in the long term. Eventually, we look forward to seeing the students take on roles as mentors in research.

VII. REALISE IT'S A JOURNEY, AND IT'S NEVER OVER

While mentoring benefits students in that they advance their research output, present at conferences, and develop research skills, it is equally rewarding to be mentors. Students keep us abreast of new knowledge and appraise us of new avenues for research and new ideas. As mentors, we must recognise that we are role models and students will realise very quickly if they are just free labour for our own gain. Over time they actually move from the place of apprentice to that of a friend. By nurturing young mentees to succeed, we also increase in professional standing and stature. The Chinese wisdom succinctly epitomises this: 青出于蓝而胜于蓝, i.e. to say, the vibrant and vivid green surpasses the original hue of indigo where it came from. The mentee can surpass the mentor; indeed he should, for this is the desire of the mentor!

Notes on Contributors

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Declaration of Interest

Both authors declared no competing interests.

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