Mentoring Students in Research:

"South Carolina's future researchers are today's medical students."

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Dr. Sahhar holds a dual appointment as Chairman of the Department of Pediatrics and Medical Director of the Pediatric Intensive Care Unit at Spartanburg Regional Healthcare System with an academic rank of Professor of Clinical Pediatrics. He has completed 100 research projects since the 2012 opening of the VCOM-Carolinas campus, and is currently mentoring 34 VCOM students across 19 active research projects. We asked Dr. Sahhar to speak about his current research initiatives and approaches for involving students in his research.

As an active researcher and investigator for the last 21 years, my focus is always on translational clinical research and projects, from a single case report of discovering an association between a virus and a disease, to observational studies with large numbers of patients over many years to evaluate the efficacy and safety of a treatment or therapy modality. **On average, 18 new students get assigned and involved in my research every year.** My research categories include: single case reports/rare and unique case presentation (e.g. hMPV and Pertussis-Like Syndrome); multiple case studies/ descriptive research (e.g. Silver Russell Syndrome); retrospective/chart review/quantitative research (e.g. Diabetic Ketoacidosis); and prospective/randomized controlled trials (e.g. Heliox Therapy). Other research studies include community focused/health promotion (e.g. PLAY Program), medical innovation (e.g. Lumbar Puncture Assist Tool), and educational studies (e.g. Pre-Clinical Experience).

Currently, my research focus and priority is to address and investigate the current emerging issues and trends affecting the pediatric population. To list a few:

1.**Multisystem Inflammatory Syndrome in Children (MIS-C). Is it Kawasaki-Like Syndrome or SARS-CoV-2 Triggered Kawasaki Disease?**—This is a retrospective observational clinical study. The aim of the study is to evaluate and understand the relationship between SARS-CoV-2 exposure or infection and the development of multisystem inflammation that presents either as Kawasaki disease or Kawasaki-like syndrome. The study population includes children ages 3 months to 13 years, both males and females and of different ethnicity.

2. **Multisystem Inflammatory Syndrome in Infant with Negative SARS-CoV-2 RT-PCR and Antibodies** – Since the declaration of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic in March 2020 by the World Health Organization (WHO), there has been an emergence of a new syndrome, termed multisystem inflammatory syndrome in children (MIS-C), associated with coronavirus disease 2019 (COVID-19). MIS-C is defined by the presence of fever, systemic inflammation, and multiorgan dysfunction in association with SARS-CoV-2 infection or COVID-19 exposure. Knowledge of this syndrome's presentation and pathophysiology is constantly evolving as more cases are reported in the literature. This case study identifies a 3-month-old patient who tested negative for SARS-CoV-2 antigen, reverse transcriptase polymerase chain reaction (RT-PCR), and antibodies, but qualified for the diagnosis of MIS-C. **To the best of our knowledge following extensive research at the time of this publication, we report the youngest pediatric patient with the diagnosis of MIS-C.** We document this case with intentions of contributing to further understanding of the variable manifestations of MIS-C and the importance of early diagnosis and treatment with intravenous immunoglobulin (IVIG). The research poster was presented by a **student investigator, Karly Derwitz (OMS-IV), and received a 2nd place award** in the Clinical Research category at the American Osteopathic Association's OMED 2020 virtual meeting in October.

3. **Kawasaki Disease: Does Early Diagnosis and Treatment Improve Outcome and Prevent Complications?** — Kawasaki disease (KD) is an acute, self-limited vasculitis of unknown cause that has an affinity for negatively impacting the coronary arteries of infants and young children. Common cardiac complications include coronary artery aneurysms; depressed myocardial contractility and heart failure may develop. If left untreated, about 25% of patients will develop coronary artery disease (CAD) or coronary lesions. Intravenous immunoglobulin (IVIG) treatment reduces morbidity and mortality related to cardiac involvement; however, how quickly results are seen is unknown.

This retrospective study seeks to determine if early diagnosis and treatment of Kawasaki Disease (KD) with Intravenous immunoglobulin treatment (IVIG) between five and ten days of initial fever presentation will have long term effects on development and progression of Coronary Artery Disease (CAD) in these children as well as prevent the development of CAD in those who have normal echocardiographic results at presentation.

Our consecutive case series adds to the medical literature in documenting that early, single-dose treatment with IVIG within five to ten days of KD fever helps in the resolution of CAD for CAD-positive patients. This study showed patients' CAD improvement as early as one year. Additionally, pediatric patients who receive single-dose treatment with IVIG within five to ten days of KD fever are less likely to develop CAD even one year after treatment. Prompt diagnosis and treatment of KD is crucial for reducing the risk of coronary artery lesions and helping to prevent the development of coronary artery aneurysm. The research poster was presented by **Carrie Downing-Larick, DO (VCOM Class of 2020) and was awarded first place** in the clinical research category at the VCOM-CC Research Day held virtually in April 2020.

How would you describe your approach to recruiting student involvement in research initiatives?

I select students who are very interested in pediatrics and seriously considering pediatrics as their future profession. To provide equal opportunity for all students interested in pediatric clinical research, I assign students according to the following criteria:

1. Achievement of a high score on the ACOP Student Chapter "Pediatric Service Award"
2. Involvement in my outreach and volunteer projects and events
3. Enrollment in a 4-week PICU rotation (OMS-III or OMS-IV)

Once students complete the above criteria, they are assigned to a research initiative. I maintain a page on my professional website which provides directions for initiating research. These six steps walk students through required research compliance and CITI training which must be completed prior to the design of the research project.

How would you describe your overall approach to involving medical students in your research?

My main role in any project is being a mentor to the students. Every project starts with an idea; a thesis to be examined and investigated. The assigned students will research the thesis and perform the literature review. When the thesis is deemed valuable and applicable, then a purpose for the research will be defined with the main aim to answer the main research question. **I put together the main frame for the study design and the students initiate the study** starting with the Institutional Review Board (IRB) application when required. Once approved, the study will be launched starting with data collection performed by the students. Once the study has been completed, a biostatistician will input the data and produce the results. A team meeting, including myself, the students and the biostatistician, will be convened to review the results and analyze its reproducibility. Once the study has been validated, the study abstract and poster will be generated and the study will be presented by the students at the College annual research meeting as well as at a national conference, such as ACOP and AOA/OMED. Feedback from the experts will be summarized and the final study manuscript will be prepared for submission to a scientific journal for final publication.

My goals in involving medical students with my research:

Primary Goal: Experience. I teach and mentor students who gain education and experience in the research process and field.

Secondary Goal: Presentation. Students gain experience by presenting their studies at local and national conferences; either as oral or poster presentations.

Ultimate Goal: Publication. Students learn how to publish the study in a medical/scientific journal to share the results with the medical community. The students also benefit through enhancing their curriculum vitae to support the pursuit of higher education goals or professional growth.

Is there anything else about engaging students in research that you would like to share with us?

Research is rewarding, but it requires patience, dedication, and time allocation. As an example, in one calendar year, I conducted 15 pediatric clinical research projects involving more than 20 VCOM medical students. The average amount of time I invested at the different steps of those projects was 15 hours per week.

Above, Dr. Sahhar with student researchers, ACOP Research Award 2015; ***Above right***; LPat Invention testing; ***Right***, VCOM Research Day 2018.