

St George's University's Medical Student Research Institute: A Novel, Virtual Programme for Medical Research Collaboration

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ABSTRACT

Objective: Medical student research involvement has evolved to be a core component of medical education and is becoming increasingly vital to success in the United States residency match. We sought to develop a research website allowing students and research faculty to collaborate and complete projects online.

Methods: The Medical Student Research Institute (MSRI) was developed by the St George's University School of Medicine in 2009 to encourage, support, facilitate and centralize medical student research.

Results: There are 63 active students in the MSRI (22 students in basic science and 41 students in clinical rotations). The mean GPA for basic science student members was 3.81 ± 0.27 and was 3.80 ± 0.20 for clinical student members. The mean United States Medical Licensing Examination (USMLE) Step 1 score was 241.6 ± 17.5 . Since 2009, MSRI students have published 87 manuscripts in 33 different journals and have presented at 14 different national and international conferences.

Conclusion: A web-based MSRI provides a virtual, entirely online resource for coordinating remote research collaboration between medical students and faculty whose opportunities would be otherwise limited. Initial experiences with the programme have been positive and the framework and concept of the MSRI provides a platform for university and medical schools to provide research opportunities to students who may not have face-to-face access to research faculty.

Keywords: Medical research, residency application, web-based research programme

Instituto de Investigación Médica Estudiantil de la Universidad de Saint George: Un Programa Virtual Novedoso para la Colaboración en la Investigación Médica

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RESUMEN

Objetivo: La participación estudiantil en la investigación médica ha evolucionado hasta llegar a ser un componente esencial de la educación médica, y se está convirtiendo cada vez más en un elemento vital para el éxito en obtener una plaza en los programas de residencia de medicina en los Estados Unidos. Buscamos desarrollar un sitio web de investigación que permita a los estudiantes y profesores de investigación colaborar y realizar proyectos online.

Métodos: El Instituto de Investigación Médica Estudiantil (MSRI por sus siglas en inglés) fue desarrollado por la Escuela de Medicina de la Universidad de Saint George en 2009 para estimular, apoyar, facilitar y centralizar la investigación médica estudiantil.

Resultados: Hay 63 estudiantes activos en el MSRI (22 estudiantes en ciencias básicas y 41 estudiantes en rotaciones clínicas). El promedio general de calificaciones (PGC) de los miembros estudiantes de ciencias básicas fue 3.81 ± 0.27 , y el de los miembros estudiantes clínicos fue 3.80 ± 0.20 . La puntuación promedio obtenida en el primer paso del Examen de Licencia Médica de los Estados Unidos (USMLE, en inglés) fue 241.6 ± 17.5 . Desde 2009, los estudiantes del MSRI han publicado 87 manuscritos en 33 diferentes revistas, y han presentado trabajos en 14 conferencias nacionales e internacionales.

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Conclusión: *Un MSRI basado en la red de la Internet proporciona un recurso virtual, totalmente online, que permite coordinar la colaboración a distancia entre estudiantes y profesores de medicina, quienes de lo contrario verían limitadas sus oportunidades. Las experiencias iniciales con el programa han sido positivas. El marco y los conceptos del MSRI proporciona una plataforma para que la Universidad y las escuelas de medicina puedan brindar oportunidades de investigación a los estudiantes que no tengan acceso presencial a la Facultad de investigación.*

Palabras claves: Investigación médica, solicitud de residencia, programa de investigación con base en la red

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INTRODUCTION

Medical student involvement in research prior to applying for residency is becoming increasingly important for success in the United States (US) National Residency Matching Programme [NRMP] (1–2). For example, from 2007 to 2009, the mean number of publications, abstracts and/or presentations for graduates in the United States of America (USA) applying to Family Medicine residency programmes increased from 1.0 to 1.4, and from 1.1 to 1.4 for international medical graduates [IMG] (3). Over the same time period, the most competitive specialties (*ie* integrated plastic surgery) continued to demand scholarly aptitude for success in the residency match [US graduates: mean 8.2 publications, abstracts and/or presentations in 2009; IMGs: mean 16.8 publications, abstracts and/or presentations in 2009] (3).

St George's University (SGU) School of Medicine, established in 1976 on the island of Grenada, is the oldest, most established international medical school in the Caribbean. It provides the largest number of foreign-trained physicians to the healthcare workforce in the USA annually. Academically, the School of Medicine has major clinical training sites in the northeast (primarily New Jersey and New York), midwest (primarily Michigan and Ohio), southeast (primarily Florida) and southwest (primarily California), providing students with many clinical opportunities across the USA. However, given SGU's numerous clinical sites, the University sought novel means to develop programmes that would coordinate research across all clinical centres.

Recognizing that research is an integral part of a university, the School of Medicine at SGU established the Medical Student Research Institute (MSRI) in 2009 to encourage, support, facilitate and centralize medical student research. By identifying the evolving needs of today's medical students, SGU sought to: (i) identify students interested in research during the basic science and clinical years of medical school with a track record of excellent academic achievement, (ii) identify SGU-affiliated faculty with a track record of published research and an active interest in student research and education, and (iii) create a virtual website to coordinate SGU-affiliated faculty with selected students interested in research.

We present the initial experience with the MSRI, including website development and navigation, applicability of a virtual research programme to other medical schools and uni-

versities, and the potential challenges the MSRI and all virtual research programmes may face in the future.

MSRI programmes

The MSRI offers two programmes: MD degree with Distinction in Research and MSRI Research Membership. The MD with Distinction in Research programme provides exceptional SGU School of Medicine students with an opportunity to be involved in sustained work in either basic, clinical, translational or social sciences, as part of their medical school training. Students enrolling in the first two years of medical school must fulfil the following criteria for acceptance: (i) minimum grade point average (GPA) of 3.70, (ii) curriculum vitae, (iii) personal statement explaining how the MSRI would benefit the student, (iv) letter of recommendation, (v) interview, and for students in clinical rotations (vi) United States Medical Licensing Examination (USMLE) Step 1 score. To be issued the MD degree with Distinction in Research, students must: (i) complete a minimum of two projects (original report or review article), in which the student is the 1st or 2nd author and (ii) maintain a grade point average (GPA) of > 3.70 throughout the duration of medical school.

Students in the MSRI Research Membership programme have similar acceptance criteria as the MD with Distinction in Research programme with the exception of a minimum GPA of 3.50. This programme allows students with a strong academic record to be involved in research projects during their clinical years.

Website development and testing

The MSRI was designed on two separate but digitally inter-linked systems. A required password protects access to the site hosted on SGU's intranet server. The MSRI main page is a central management system (CMS) database driven website tool from Centralpoint-Oxycon® (Middleburg Heights, Ohio). This asp.net CMS allows the website to be maintained without hypertext markup language (HTML) and allows administrators to upload documents to the website. The second MSRI inter-linked system is the Project Portal, a third party licensed active server page (ASP) CMS (Centralpoint-Oxycon®, Middleburg Heights, Ohio). This system provides the capacity to manage the MSRI projects, allows faculty members to assign specific tasks to student members and generates extensive pro-

ject progress reports. The MSRI Console (Centralpoint-Oxycon®, Middleburg Heights, Ohio) is a third, front and back ended programme providing access control over the MSRI main page to MSRI administrators.

The MSRI main page was extensively alpha and beta tested to ensure all website links were operational prior to the website launch. Test projects were created and uploaded *via* the console to the MSRI main page to ensure accuracy and interplay between the two systems. Furthermore, the project portal was also tested extensively with test projects, allowing us to identify software built-in functions that were necessary to

faculty and student members. This process permitted streamlining the ability to assign and receive/complete tasks by designing user levels based on user status (administration, faculty or student).

Website navigation

Accessing the website – The MSRI website is only accessible to SGU students and registered SGU faculty members. Both students and faculty access the SGU homepage (www.sgu.edu) and subsequent log-in brings the user to the MSRI homepage (Fig. 1a).

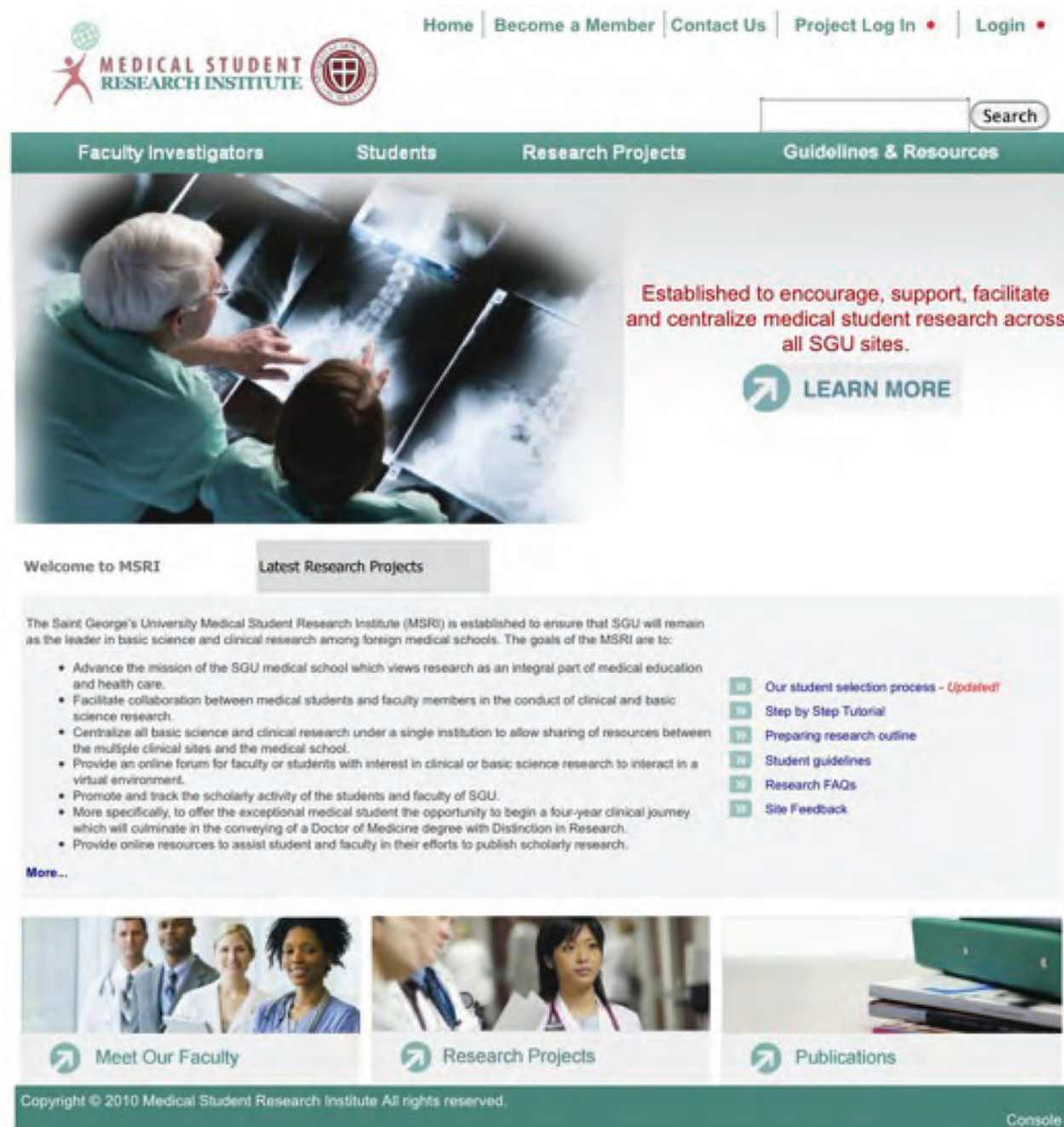


Fig. 1a: The Medical Student Research Institute: homepage.

Becoming a member, proposing projects, project selection

– To become a member of the MSRI, the user selects ‘Become a Member’ at the top of the homepage and selects ‘Faculty Investigators’ (Fig. 1b) or ‘Students’ and completes the appropriate form. Faculty members are then able to propose a project (‘Research Projects’) and specify ‘Propose a Project – Basic Science’ or ‘Propose a Project – Clinical Science’. The faculty member then selects the ideal candidate(s) for the project and completes a form in order to activate the project (‘Pro-

ject portal provides access to the tasks for the project (outline, abstract, manuscript) and allows personalized e-mail communication between the faculty investigator and the student directly. When the student is ready to upload a completed draft to the project portal, the student accesses the ‘File Attachment(s)’ tab at the top of the appropriate task page. Any previous draft that the student or faculty investigator has uploaded can be downloaded at any time.

Fig. 1b: The Medical Student Research Institute: faculty investigator registration form.

file Manager’ and selecting ‘Add Students to Project’). Students are able to search for approved research projects under ‘Available Project List’ and ‘Research Projects’ on the main MSRI website (Fig. 1a). The ‘Available Project List’ option shows the student every proposed project currently available and allows the student the option to contact the faculty investigator for a particular project to express interest by clicking the ‘Contact Now’ button next to the project. The ‘Advanced Search’ option allows the student to search available projects based on their specific specialty of interest.

Project portal – Once a registered project has been approved and activated on the Project Portal (Fig. 1c) by the MSRI, the user receives an e-mail from the MSRI administration with a username and password for the project portal, which is designated “Project Log In” on the MSRI homepage (Fig. 1a). The

Website administration console – The MSRI console allows the website administrator to conveniently update and manage the website. When a faculty investigator, student or project is proposed, an e-mail is generated to an MSRI Gmail® account, alerting the MSRI administration of the appropriate activity on the MSRI website. Separate directories in the MSRI console created for research projects, student research members and faculty members allow convenient activation following appropriate completion of these forms on the MSRI website. A second directory entitled ‘Publishing’ allows the administrator to update the published articles and presented abstracts for viewing on the MSRI homepage.

Additional features of the website – From the homepage, the user has the option of accessing a list of the latest published manuscripts and presented abstracts. In addition, there are di-

My Tasks (44)

Quick action + Add a task to this project...

Project	#	Summary	Status	Priority	Creator	Assigned	Reviewer
Acinetobacter Infections in Surgical Patients: A N	1	Outline	To do	Normal	MSRI-Admin	vanand	MSRI-Admin, RChamber
Project Template	1	Outline	To do	Normal	MSRI-Admin		MSRI-Admin
Evidence based review on the treatment of keloid s	1	Outline (1)	To do	Normal	MSRI-Admin	mpellerin	bdesouza, MSRI-Admin
Empiric Treatment Option in the Management of Comp	1	Outline	To do	Normal	MSRI-Admin	jchomin	MSRI-Admin, RChamber
Managing Menopausal Symptoms in Young Survivors of	1	Outline (3)	To do	Normal	MSRI-Admin	kboyko	MSRI-Admin, RChamber
Has Avastin Changed the Pattern of Recurrence for	1	Outline (1)	To do	Normal	MSRI-Admin	amehta	MSRI-Admin, RChamber
Insight into Hospitalization of Centenarians: A 10	1	Outline	To do	Normal	MSRI-Admin	sanunthavanathan	MSRI-Admin, RChamber
Myocardial Infarction in Nonagenarians and Centena	1	Outline	To do	Normal	MSRI-Admin	ShalendraSingh	MSRI-Admin, RChamber
Staple Laparoscopy in Digestive Tumors: A Rev	1	Outline (1)	To do	Normal	MSRI-Admin	ahag	MSRI-Admin, RChamber
Outcome Analysis of Nonagenarians Admitted to the	1	Outline	To do	Normal	MSRI-Admin	ahag, alanteri	MSRI-Admin, RChamber
Unresectable Cancer Metastasis to the Brain: When Sh	1	Outline (1)	To do	Normal	MSRI-Admin	fshweikeh	MSRI-Admin, RChamber
Does the Type of Chemotherapy Received After the F	1	Outline (1)	To do	Normal	MSRI-Admin	jgruhler	MSRI-Admin, RChamber
Surgical outcomes in nonagenarians and centenarian	1	Outline	To do	Normal	MSRI-Admin	npores	MSRI-Admin, RChamber
Incidence and outcome of post-burn osteomyelitis a	1	Outline	To do	Normal	MSRI-Admin	zkombal	MSRI-Admin, RChamber
Comparison of Diabetic and Non-Diabetic Burn Patie	1	Outline	To do	Normal	MSRI-Admin	skralovic	MSRI-Admin, RChamber
Usefulness of Staging Laparoscopy for Advanced Gas	1	Outline (1)	To do	Normal	MSRI-Admin	syousuf	MSRI-Admin, RChamber
Evidence based review of wrist ganglia	1	Outline	To do	Normal	MSRI-Admin	mprioras	bdesouza, MSRI-Admin
A comparative analysis of Breast MRI and Mammogram	1	Outline	To do	Normal	MSRI-Admin	areeves	MSRI-Admin, RChamber
Women's Health in Grenada	1	Outline	To do	Normal	MSRI-Admin	j Sawyer	abaldwin, MSRI-Admin
Defining a place for Nipple Sparing Mastectomy in	1	Outline (3)	To do	Normal	MSRI-Admin		MSRI-Admin
Pelvic exenteration- is there a role for pelvic ex	1	Outline (3)	To do	Normal	MSRI-Admin		MSRI-Admin
Lithium induced Hypercalcemia: A comprehensive rev	1	Outline	To do	Normal	MSRI-Admin		MSRI-Admin
Pancreatic Tumor Markers: An update on prognostic	1	Outline	To do	Normal	MSRI-Admin		MSRI-Admin
A Comparison of Demographics, United States Medica	1	Outline	To do	Normal	MSRI-Admin	pgo	MSRI-Admin, RChamber
Myth or Reality: Do Program Directors Analyze Appl	1	Outline	To do	Normal	MSRI-Admin	pgo	MSRI-Admin, RChamber

First Previous [1 2 of 2] Next Last

Fig. 1c: The Medical Student Research Institute: project portal homepage.

rect links for the student selection process, a step-by-step tutorial for website navigation specific for faculty members and students, guidelines on preparing a research outline, student guidelines, frequently asked questions, and site feedback. A 'Guidelines and Resources' tab on the homepage allows the user to access tutorials including: grant-writing tips, extramural funding opportunities, sample submission guides for authors and medical statistical support.

MSRI student demographics, peer-reviewed journals and conferences

Sixty-three students are currently active in the MSRI, including 22 students (34.9%) in the basic sciences (1st and 2nd year of medical school) and 41 students (65.1%) in clinical rotations [3rd and 4th year of medical school] (Table 1). Students in the basic sciences had a mean GPA of 3.81 ± 0.27 and students in clinical rotations had a mean GPA of 3.80 ± 0.20 .

Table 1: Demographics of basic science and clinical student members of the MSRI

	Basic science students	Clinical students
Members, n (%)	22 (34.9)	41 (65.1)
Male/Female	11M:11F	27M:14F
GPA (mean $\pm$ SD)	3.81 ± 0.27	3.80 ± 0.20
USMLE Step 1, score (mean $\pm$ SD)	N/A	241.6 ± 17.5

MSRI – Medical Student Research Institute, GPA – grade point average (out of 4.00), USMLE – United States Medical Licensing Examination

Clinical students had a mean USMLE Step 1 score of 241.6 ± 17.5 .

Since 2009, MSRI students have published manuscripts in 33 peer-reviewed journals, including journals pertaining to surgery (eg Journal of Gastrointestinal Surgery, Journal of

Table 2: Published and in press manuscripts from MSRI students since 2009

Manuscript type	Published and in press manuscripts
Original, n (%)	32 (36.8)
Review, n (%)	30 (34.5)
Historical/Educational, n (%)	16 (18.4)
Case reports, n (%)	9 (10.3)
Total	87

MSRI – Medical Student Research Institute

Neurosurgery, American Journal of Surgery), anatomy (*eg* Clinical Anatomy, Journal of Anatomy), medicine (*eg* International Journal of Cardiology, Gastroenterology), oncology (*eg* Cancer) and pathology (*eg* Journal of Cutaneous Pathology). Up to March 2011, students in the MSRI have published 87 manuscripts in peer-reviewed journals, including 32 original articles (36.8%), 30 review articles (34.5%), 16 historical/educational articles (18.4%) and nine case reports (10.3%) (Table 2). Concurrently, MSRI students have presented at 14 national or regional academic conferences.

DISCUSSION

Implementation of research into a medical student's academic profile fosters critical thinking skills, promotion of life-long learning and creativity and prepares students to be physician-investigators (4–5). Scholarly activity among medical students has become increasingly common in medical schools in both USA and Canada (5), and several institutions have used such scholarly pursuits to develop leaders in medicine. Duke University School of Medicine represents the cornerstone of scholarly programmes, dating back to 1959 when the third year of medical school was designated as dedicated time for scholarly activity. Stanford University School of Medicine's tradition of encouraging medical student research also dates back to 1959, becoming a required component of the medical student curriculum in 2003 (6). Both Duke and Stanford evaluate the effectiveness of their programmes by surveying students' intentions to pursue a career in academic medicine and by the number of peer-reviewed publications produced during medical school (6). The Duke class of 2010 reported that they were more interested in an academic career after their research experience (81%) compared to before (71%). Furthermore, 28% of students reported having a manuscript accepted for publication during their research year and 92% of students had a manuscript in preparation or under review (6).

In 1995, the Mount Sinai School of Medicine (MSSM) created the Office of Student Research Opportunities to offer and encourage students to be involved with basic science or clinical outcomes research (7). Moreover, MSSM formally recognized student involvement in research with a Distinction in Research Programme. Similar to SGU's recognition (MD with Distinction in Research), MSSM does not accept case reports as fulfilling the research requirement and students must undertake the majority of the writing of the manuscript (7). An

additional requirement that MSRI students must have is to maintain a 3.70 GPA, which the school administration believes supports the notion that students graduating with this honour have a track-record of both strong academic and scholarly achievement.

The concept of the MSR, which allows geographically separated students and faculty to interact, share ideas and ultimately complete all scholarly research in a virtual environment, is not only applicable to other foreign medical schools who have students rotating across the USA but also to American universities and medical schools with campuses overseas. The last few years have seen a surge in American universities rushing to establish campuses overseas, including New York University, Michigan State University and Rochester Institute of Technology (8). Furthermore, the Weill Cornell Medical School has established the first overseas American medical school campus in Qatar, graduating their first class in 2008 with a US Medical Degree (9). A fully functional virtual research website would provide students at these satellite campuses an opportunity to collaborate with faculty in the USA, particularly if the overseas campuses are not equipped to offer equivalent research opportunities.

An additional component of the MSRI that has evolved over the past two years is the concept of having research fellows work with MSRI students and research faculty. Several MSRI faculty members, who work extensively with students, have employed research fellows to work with and mentor six to eight students. The research fellow serves two purposes: (i) working extensively with students in order to assist with literature searches, project design and outlines, manuscript writing, and thus, (ii) reducing the time required for faculty to go through initial drafts of the manuscript. In these functions, the research fellows serve as "gatekeepers", forming a hierarchy among the student, research fellow and research faculty member and ensuring that faculty and student interactions are maximized. Research fellows are typically students who either failed to match into a competitive residency or elected to take a year to do research before applying to competitive specialties. Mentoring medical students allows research fellows to hone their interest in academic medicine, expand their curriculum vitae, improve their residency application and, most importantly, allows them to establish a solid research and teaching foundation going into residency. All research fellows associated with the MSRI have successfully matched into residency positions of their choice, including categorical general surgery, internal medicine and urology.

The MSRI was initially designed to identify the top 15% of SGU medical students, work with them extensively to develop superb analytical and writing skills, mentor them through the medical publishing process and ultimately assist them with getting into a competitive residency programme or institution. Ultimately, the 10-year goal of the MSRI is to encourage up to 50% of all medical students to be actively engaged in research. Thus, the success of the MSRI is graded on objective (number of publications/manuscripts accepted) and subjective evalua-

tion (success of MSRI members in the annual residency match). The ratio of students to the number of papers published over the past two years shows that 63 members have published 87 manuscripts for a ratio of 1.4 manuscripts/member. To date, all students who have completed more than one year in the MSRI have a minimum of one published manuscript with several members publishing more than three manuscripts. Furthermore, analysis of residency placement for the inaugural members of the MSRI has seen individuals matched into urology, ophthalmology, categorical general surgery, emergency medicine and integrated vascular surgery, all specialties that have been traditionally difficult for international medical graduates to attain residency positions.

Challenges

A number of challenges facing the MSRI need to be addressed as we move forward. Firstly, faculty recruitment is vital to ensuring a wide breadth of available projects across all medical specialties. The challenge is recruiting faculty to the MSRI with a track record of scholarly activity and medical student education experience. Faculty members volunteer their time to work with the student thus, there is no compensation in addition to “loss of opportunity costs”, particularly for private physicians. Secondly, keeping student motivation at a high level is vital to the success of both the student and the MSRI. All projects are reviewed by the MSRI administration every four weeks to ensure that ongoing and timely progress is occurring between the student and faculty member. That said, we realize that a certain degree of leniency is necessary when working with both students and busy faculty; at certain times, third and fourth year students have more (*ie* research elective) and less (*ie* surgery rotation, studying for USMLE Step 2) time to work on assigned projects.

We believe that a web-based MSRI has the opportunity to alter student and faculty attitudes toward publishing research and change the career paths and opportunities for all involved. After our initial experience with the programme, we remain enthusiastic that the framework and concept of an MSRI can provide a platform for universities and medical schools to broaden research opportunities available to students, who may not have frequent or any face-to-face access to research faculty.

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