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Role Model in Surgical Education: The Influence of Surgical Sub-Specialty

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ABSTRACT

Background: In surgical training, a role model is a senior surgeon who inspires trainees to develop their own surgical practice and career path by exemplifying the desired professional behaviors, technical skills, and ethical conduct. This study sought to evaluate the role of models in surgical education, particularly examining the impact of surgical specialty trainees. **Methodology:** This prospective descriptive study collected data from 105 Sudanese surgical registrars between 15 October 2024 and 20 Novemver 2024. Participants were chosen at random through a simple randomization process, without consideration for their age, gender, or any other demographic traits. **Results**: The study examined 100 medical registrars in Sudan, comprising 68 males and 32 females, with ages ranging from 20 to 54 years and an average age of 35 years. The majority of participants fell under the Obstetrics and Gynecology category, accounting for 40%, followed by General Surgery at 26% and Urology at 19%. **Conclusion**: A significant number of Sudanese surgical specialty trainees recognize the impact of "role models" on their educational and professional growth. The majority of surgeons in Sudan are males. Obstetrics and Gynecology stands out as the surgical specialty most preferred by physicians. Orthopedics and ophthalmology registrars are significantly impacted by role models in surgical education.

Keywords: Role Model, surgical education, technical skills, professionalism, Sudan

INTRODUCTION

Medical and surgical education represents a broad domain characterized by numerous challenges [1]. Surgeons are typically assessed based on their surgical skills and outcomes, rather than their character traits [2]. Numerous studies emphasize the significance of positive role models and mentors in shaping the career decisions of medical students [3].

Virtual reality technology presents a promising avenue for enhancing surgical training solutions [1]. The ongoing challenges in surgical training have prompted an exploration of augmented reality as a possible tool for enhanced education [4]. Augmented reality in surgical education proves to be both feasible and effective as a complement to traditional training methods. The Microsoft HoloLens has demonstrated significant results across all parameters and has enhanced performance measures in surgical trainees [5]. Mentoring, coaching, role modeling, and teaching are all strategies through which individuals assist in the development of others. While there are certain similarities among those offering guidance to the recipient of the development efforts, significant differences are present. Instructions on effectively fulfilling one of these roles are included, along with advice on how a surgical resident can leverage this outstanding opportunity for career advancement [6].

Previous research indicates that positive interactions with surgeons can shape perceptions of surgical careers. Junior doctors demonstrated a twofold increase in interest in surgical careers when they identified a positive surgical role model. Medical school demographics are shifting, characterized by a rising proportion of female and graduate-entry physicians. These groups exhibit a lower propensity to pursue surgical careers, thus emphasizing the need to foster interest in surgery to ensure a steady influx of qualified applicants. Establishing and advocating for perceptions of surgical role models within the broader surgical community could serve as a potential approach to address this issue [7]. This study aimed to evaluate the role model in surgical education, specifically examining the impact of surgical subspecialty.

MATERIALS AND METHODS

This study is prospective and descriptive in nature, with data collected from 105 Sudanese surgical registrars between 15 October 2024 and 20 November 2024. Participants were selected randomly using a simple random sampling method, independent of age, gender, or other demographic characteristics. Surgical registrar doctors were encountered in various public locations, including medical clinics and educational institutions.
No specific criteria for inclusion or exclusion were established. The sample size was determined utilizing survey software, employing a 95% confidence interval. The tool is accessible at: https://www.surveysystem.com/sscalc.htm
A purposeful questionnaire was developed and utilized for the collection of the necessary data.

Ethical consent: All participants were required to provide written ethical consent during the data collection process. The Human Ethics Committee at the Prof Medical Research Consultancy Center, El-Obeid, Sudan, developed and approved the informed ethical consent form.

Ethical Approval: The human research ethics committee at MRCC has approved this research proposal (Approval number: HREC 00011/MRCC.1/25).

Statistical Analysis: The data sets were imported into the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL), to get percentages and cross tabulations.

RESULTS

This study addressed 100 Sudanese medical registrars (68 males and 32 females) aged 20 to 54, with an average age of 35 years. According to Table 1 and Figure 1, the majority of participants were in the obstetrics general surgery group, accounting for 40%, followed by general surgery (26%) and urology (19%).

Table 1. Distribution of the study subjects by gender, age, and specialty

Variable	Males n=68	Females n=32	Total n=100
Age			
<30 years	18	11	29
30-34	17	14	31
35-39	10	3	13
40-44	11	1	12
45+	12	3	15
Specialty			
General GS	22	4	26
Urology	19	0	19
Orthopedics	6	1	7
Obstetrics	19	21	40
Pediatrics surgery	2	0	2
Ophthalmology	0	6	6

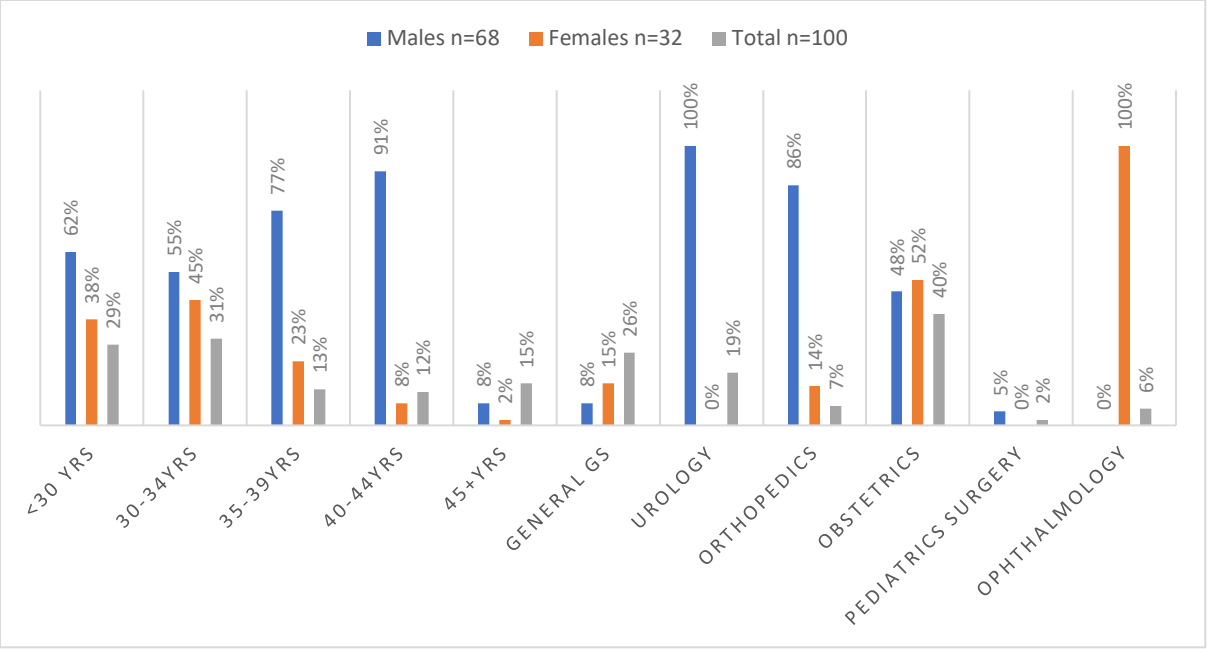

Figure 1. Distribution of the study subjects by gender, age, and specialty

Table 2 and Figure 2 show the distribution of contributors by expertise, technical skills, communication skills, professionalism, and leadership. Obstetrics was the most popular choice for surgical role models in terms of technical ability, communication skills, professionalism, and leadership. General surgery and urology came next. However, variables within the group differ significantly. For general surgery, 21/26 (80.7%), 21 (80.7%), 23 (88.4%), and 19 (73%) chose technical capabilities, communication skills, professionalism, and leadership (as critical characteristics of role models). For Urology Technical Skills, Communication Skills, Professionalism, and Leadership (as essential traits of role models), 17/19 (89.4%), 15 (78.9%), 16 (84.2%), and 11 (57.8%) were chosen in this order.

In orthopedics, technical skills, communication skills, professionalism, and leadership (as critical traits of role models) were chosen by 7/7 (100%), 5 (71.4%), 5 (71.4%), and 5 (71.4%), respectively. Obstetrics, technical skills, communication skills, professionalism, and leadership (as essential traits of role models) were chosen by 35/40 (87.5%), 23 (57.5%), 25 (62.5%), and 26 (65%), respectively.

For pediatrics, technical skills, communication skills, professionalism, and leadership (as critical traits of role models) were selected by 1 (50%), 1 (50%), 1 (50%), and 2 (100%). For ophthalmology, technical skills, communication skills, professionalism, and leadership (as essential traits of role models) were selected by 6 (100%), 5 (83.3%), 6 (100%), and 5 (83.3%).

Table 2. Shows the distribution of contributions by specialization and the criteria they use to designate someone as a role model (technical skills, communication skills, professionalism, and leadership).

Variable	General GS	Urology	Orthopedics	Obstetrics	Pediatrics	Ophthalmology	Total
Technical Skills							
No	5	2	0	5	1	0	13

Yes	21	17	7	35	1	6	87
Total	26	19	7	40	2	6	100
Communication skills							
No	5	4	2	17	1	1	30
Yes	21	15	5	23	1	5	70
Total	26	19	7	40	2	6	100
Professionalism							
No	3	3	2	15	1	0	24
Yes	23	16	5	25	1	6	76
Total	26	19	7	40	2	6	100
Leadership							
No	7	8	2	14	0	1	32
Yes	19	11	5	26	2	5	68
Total	26	19	7	40	2	6	100

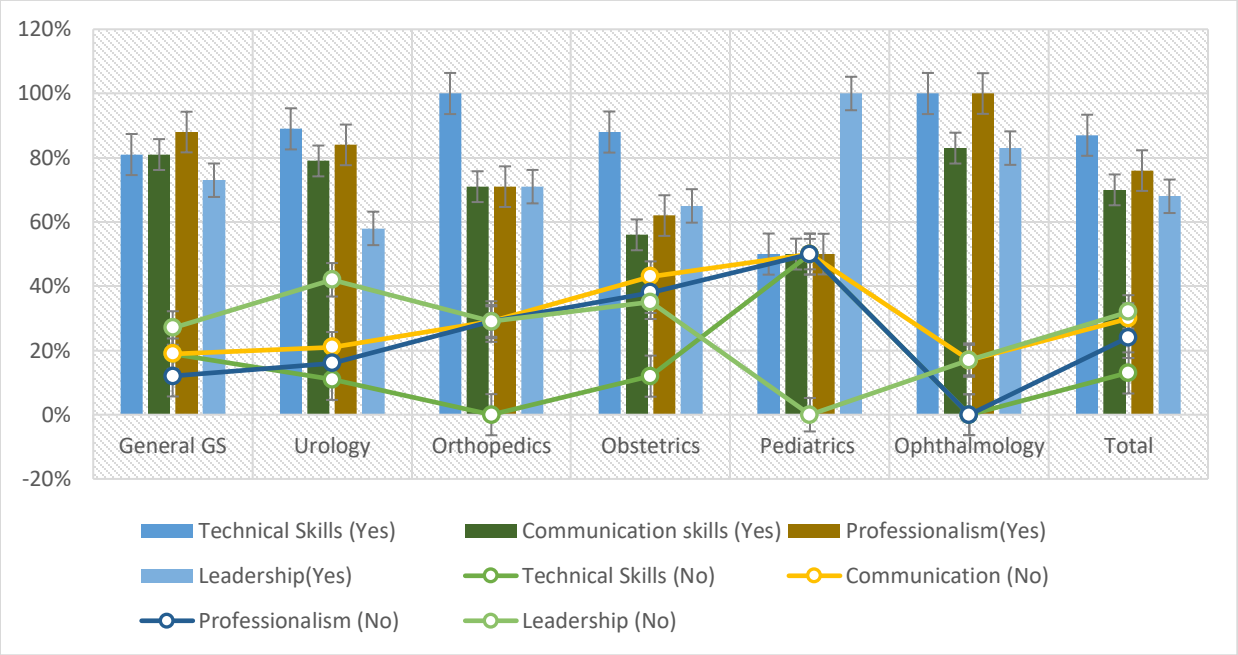

Figure 2. Description of the contributors by specialtyand their criteria used to identify someone as a rolele model (technical skills, communication skills, professionalism, and leadership).

Table 3 and Figure 3 summarize the distribution of participants by specialty and the criteria employed to identify individuals as role models, which include ethical behavior, empathy and patient care (EPC), teaching ability, and research and academic contributions (RAC).

Table 3. Distribution of the participants by specialtyand their selected attributes of effective role modelss (ethical behavior, empathy and patient care (EPC), teaching ability, research,, and academic contributions (RAC)).

Variable	General GS	Urology	Orthopedics	Obstetrics	Pediatrics	Ophthalmology	Total

Ethical behavior							
No	7	4	0	14	0	4	29
Yes	19	15	7	26	2	2	71
Total	26	19	7	40	2	6	100
EPC							
No	12	5	2	18	1	1	39
Yes	14	14	5	22	1	5	61
Total	26	19	7	40	2	6	100
Teaching Ability							
No	7	7	0	15	0	3	32
Yes	19	12	7	25	2	3	68
Total	26	19	7	40	2	6	100
RAC							
No	10	7	3	27	1	3	51
Yes	16	12	4	13	1	3	47
Total	26	19	7	40	2	6	100

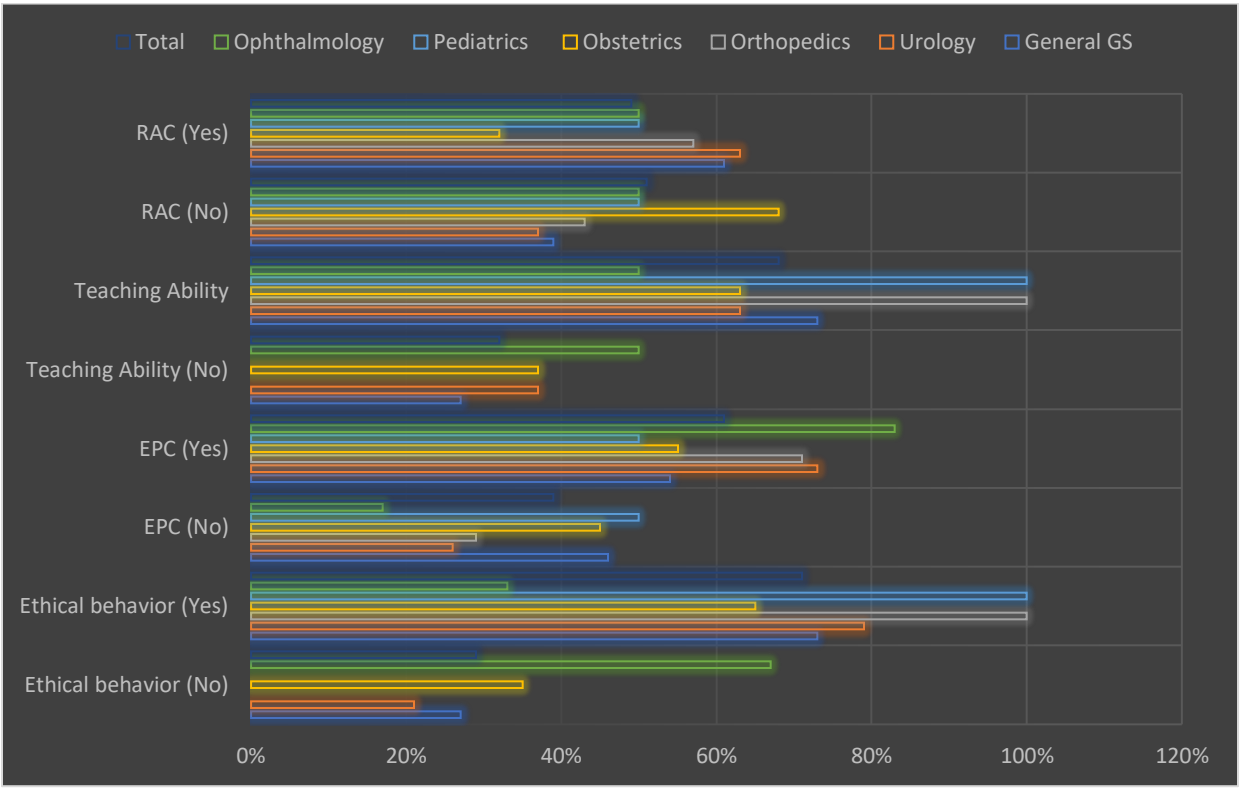

Figure 4. Description of the participants by specialty and their selected attributes of effective role models (ethical behavior, empathy and patient care, teaching ability, research, and academic contributions).

DISCUSSION

Medical education research is noticeably rare in Sudan, particularly in the field of surgical medical education. The primary goal of this study is to shed light on the importance of role models in surgical education, with a focus on the impact of surgical specialties. A surgical education "role

model" is a senior surgeon, typically an attending physician or chief resident, who motivates and guides surgical trainees by displaying excellent surgical skills, ethical conduct, patient care, and positive professional characteristics [7].

Most surgical trainees in this study were male, with a male-to-female ratio of 2.13:1.00. These findings have been documented in prior literature. A meta-analysis in this context revealed a statistically significant gender difference, with only 16.7% of surgeons identified as female. Temporal trends showed that the number of female surgeons was slowly rising. However, specialty-specific analysis showed that there were differences, with fewer women working in cardiac surgery and more working in colorectal surgery. This study offers evidence-based insights into the ongoing gender gap in surgical specialties, highlighting the necessity for targeted interventions to improve inclusivity and equity within the surgical workforce. The results show how demographic, temporal, and specialty-specific factors interact in complex ways. This lays the groundwork for future efforts to make the surgical field more diverse and welcoming [8].

Gender and racial disparities continue to exist in the consultant general surgical workforce, marked by a lack of diversity in particular university or teaching hospital surgical departments and certain subspecialties. The predominant cohort of practicing consultants comprises surgeons in their fourth decade of clinical practice, suggesting a potential workforce crisis should senior clinicians choose to reduce their activity or retire early [9].

The predominant surgical specialty identified in this study was obstetrics, followed by general surgery and urology, with a higher prevalence in males compared to females. Addressing gender disparity in surgery represents a moral obligation and is likely to enhance patient care, financial performance, innovation, and risk assessment [10]. Several studies indicated a significant disparity in the representation of female consultants and specialty registrars across surgical specialties (both $p<0.001$). Female representation across specialties is ranked from highest to lowest as follows: Specialty Registrars: Ophthalmology 49.7%, Otolaryngology 48.2%, Pediatric Surgery 45.5%, Plastic Surgery 42.2%, General Surgery 39.8%, Urology 31.6%, Vascular Surgery 25.0%, Neurosurgery 24.7%, Cardiothoracic Surgery 21.3%, Trauma and Orthopedics 20.6%. Consultants in various specialties include Ophthalmology 32.4%, Pediatric Surgery 31.7%, Plastic Surgery 20.9%, General Surgery 17.5%, Otolaryngology 17%, Vascular Surgery 13.7%, Urology 11.7%, Cardiothoracic Surgery 10.8%, Neurosurgery 8.2%, and Trauma and Orthopedics 7.3%. From 2011 to 2020, there was a significant rise in the number of women working as specialty registrars in all fields except pediatric surgery (which always had more than 45% of the positions) and vascular surgery (which never had more than 30%). General Surgery is expected to achieve gender parity among its specialty registrars by 2028, Urology by 2033, Neurosurgery by 2064, Trauma and Orthopedics by 2070, and Cardiothoracic Surgery by 2082 [11].

There is a rising global interest in improving the quality and quantity of surgical training program graduates in low-resource countries. The needs assessment of stakeholders in training programs is the foundation of this procedure. Trainees in this study found problems with training and suggested ways to fix them. These findings should be used to change surgical training in Sudan and other similar places [12].

Notwithstanding advancements in the past decade, gender inequality endures within the surgical field, with notable variations among surgical specialties. More research is needed to find out why these differences have been seen, especially in Vascular Surgery, Cardiothoracic Surgery, Neurosurgery, Trauma and Orthopedics.

About 87% of the people who answered the survey said that technical skills were important when looking for a "role model." This was especially true for people in the orthotics (100%) and ophthalmology (100%) specialties. Today's effective leaders enable their people to improve both technical and non-technical skills. So far, the focus in the perioperative arena has been mostly on developing non-technical abilities, with only a few research studies examining the relationship between technical skills and patient outcomes. Technical competence necessitates an appraisal of one's own strengths and limitations, the implementation of purposeful goal-oriented practice, objective structured feedback assessment, and a focus on best practice and improved patient outcomes [13].

Seventy percent of the contributors in the current study preferred communication skills exemplified by a "role model." This preference was most pronounced in ophthalmology and orthopedic subspecialties. Unprepared surgeons or those requesting instruments not specified in the preoperative information contribute to stress and frustration. Inappropriate dynamics, inaccurate or disrespectful communication, and noise can compromise patient safety. Interdisciplinary team training highlights the importance of communication as a non-technical skill [14].

Around 76% of participants identified professionalism, with ophthalmology, general surgery, orthopedics, and urology showing a higher prevalence. Surgeons possess distinct expectations and responsibilities pertaining to professionalism. Surgeons engage with various groups, including surgical colleagues, trainees, other medical professionals, ancillary care providers, and patients. Communication among these groups must be respectful, appropriate, and effective, even within the high-stress context of surgery. The norms of professional behavior are adapting to align with contemporary practices and the growing diversity within the surgical workforce. Consequently, various surgical societies and the Accreditation Council for Graduate Medical Education have integrated professionalism as a fundamental component of surgeon assessment. Medical education curricula are increasingly formalizing the integration of traditionally modeled professionalism. Future directions for professionalism in surgery encompass validated modules, formalized surgeon evaluations, connections to credentialing, and reimbursement mechanisms [15].

Sixty-eight percent of participants identified leadership as a crucial role model in surgical education, with higher levels reported among pediatric surgeons and ophthalmologists. Emotional intelligence constitutes a critical competency for leaders in the surgical field. Various leadership styles, including authoritarian, hierarchical, transactional, transformational, adaptive, situational, and servant-shepherd, are applicable in the context of surgical leadership. Prioritizing patient care is essential for surgical leaders [16].

Ethical behavior was reported by 71% of respondents, predominantly among orthopedics and pediatrics. Surgeons must possess proficiency in both the technical and theoretical aspects of surgery, as well as demonstrate ethical and moral integrity. A surgeon must serve as an ethical exemplar for colleagues, surgical trainees, and the broader community in which they practice [17].

Most participants in this study indicated the importance of empathy in patient care. Empathy significantly enhances patient outcomes. Empathy training is deemed necessary and should be integrated into surgical residencies via didactic instruction, role-playing, simulations, and mentorship under empathic attending role models [18].

The ability to teach is a critical component of surgical training. Theoretical resources are applicable across the entire spectrum of surgical education, encompassing the selection of

surgical apprentices to the autonomous practice of seasoned surgical professionals. The application of these concepts or theories facilitates high-quality surgical education, minimizing the impact of chance on learning outcomes [19].

The findings of the present study highlight research and academic contributions. Education research constitutes a significant aspect of the surgical literature, exhibiting comparable publication rates across journals with varying impact factors. The volume of publications is greater in general surgery journals compared to those of surgical subspecialties. A rigorous scientific approach is essential to ensure the effective training of future surgeons within the evolving paradigm of surgical training. Subspecialty journals ought to advance surgical education research to enhance comprehension and development of training within their discipline [20].

Conclusion: Most surgery registrars in Sudan recognize the significant contribution of "role models" in surgical training. Most surgeons in Sudan are male. Obstetrics and Gynecology is the surgical specialty most preferred by physicians. Orthopedic and ophthalmology surgeons are significantly impacted by their role models during surgical training and career advancement.

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