Post-Graduation Anesthesiology Program in Qatar, Viewpoints and Future Challenges [version 1; peer review: awaiting peer review]

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Abstract
Qatar is a country located on the east shores of the Arabian Peninsula. In the past three decades, Qatar has experienced significant changes in its educational and healthcare systems. At the time of writing this paper, there are two accredited Faculties of Medicine, which offer students from all over the world the possibility of becoming doctors. Residency Programs are taught in English and are accredited by Accreditation Council for Graduate Medical Education-International (ACGME-I). In this paper, we outline the organisation of Qatar medical education at undergraduate and postgraduate levels, with particular emphasis on the postgraduate anaesthesiology residency program. We outline the opportunities for curriculum development and its future challenges.

Keywords
Qatar, postgraduate, anaesthesia, residency, medical, education

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Abbreviations
ACGME-I: Accreditation Council for Graduate Medical Education-International
CBY: Clinical Based Year
CEX: Clinical Evaluation Exam
CITI: Collaborative Institutional Training Initiative
CSR: Chart Simulated recall
CPD: Continuous Professional Development
DOPS: Direct Observation of Procedural Skills
ECFMG: Education Commission for Foreign Medical Graduates
FRCA: Fellowship of the Royal College of Anesthetists
HH: His Highness
HMC: Hamad Medical Corporation
ICU: Intensive Care Unit
ID: Infectious Diseases
IFOM: International Foundations of Medicine
IHI: Institute for Healthcare Improvement
ITE: In-Training Exam
JCI: Joint Commission International
MCC: Medical Council of Canada
OSCE: Objective Structured Clinical Examination
PGY: Post-graduate Year
QBMS: Qatar Board for Medical Specialities
QI: Quality Improvement
NCCCR: National Centre for Cancer Care and Research
USLME: United States Medical Licensing Exam
WCM-Q: Weill Cornell Medicine-Qatar

Introduction
Demographics of Qatar
Qatar is a peninsula in the east of Arabia. Qatar borders Saudi Arabia from the east while surrounded by the Persian Gulf from all other directions, placing it in a strategic location near major petroleum deposits. It has an area of 11,571 square kilometres, the second smallest in the region after neighbouring Bahrain. The country's capital and largest city is Doha, which harbours a population of just over 640 thousand from the total of the 2.6 million living in the country by the end of February 2021. The long summer is characterised by intense heat and alternating dryness and humidity, with temperatures mounting to 50 degrees Celsius.

Healthcare system
Hamad Medical Corporation (HMC) was established by Emiri decree in 1979. HMC is Qatar’s premier and, to date, sole- not-for-profit health care provider. HMC manages 12 hospitals, nine specialist hospitals and three community hospitals and operates the national ambulance service and a home healthcare service.

HMC is the only healthcare organisation outside the United States to receive simultaneous Joint Commission International (JCI) re-accreditation for all its hospitals, ambulance service and home healthcare services in 2011. In 2016, HMC became the first organisation outside the United States to receive Academic Medical Centre status by the JCI.

Major hospitals affiliated with HMC include:
- Hamad General Hospital: Hamad General Hospital is a 603-bed facility located within Doha that offers trauma, emergency medicine, paediatrics, critical care, specialised surgery, specialised medicine subspecialities, laboratory services, and radiological investigations. The hospital has recently been expanded in line with the increasingly large dwellers of the city. A new operating theatre complex was recently inaugurated with 20 operating rooms, including CT and MRI hybrid theatres.
- Rumailah Hospital: Opened in 1957 as the first tertiary hospital in Qatar, the Rumailah Hospital is now a specialised hospital with 510-beds offering rehabilitative services for disabled adults, older adults, and children with special needs in addition to dermatology and dentistry services. The hospital is equipped with a laboratory and a radiology unit with magnetic resonance imaging (MRI), ultrasound, and bone densitometry equipment.
- Women's Wellness and Research Centre (WWRC): First established in 1988 as the Women's Hospital before rebranding the Women's Wellness and Research Centre (WWRC) in 2018. The WWRC provides specialised care for women and infants, including obstetrics, gynaecology, neonatal care, emergency care, and newborn screening services. WWRC has a capacity of 319 beds in total and is the nation’s busiest delivery unit, with more than 17,000 babies delivered annually.
- National Center for Cancer Care and Research (NCCCR): Formerly known as Al Amal hospital, this 86-bed research facility opened in 2004, offering advanced modern treatments for cancer patients.
- Heart Hospital: This cardiology speciality facility adjacent to Rumailah Hospital was opened in 2010 and has 116 beds.
- Al Wakrah Hospital: Opened in December 2012, this 260-bed hospital serves the needs of the rapidly growing towns of Al Wakrah and Mesaieed, located to the south of Qatar. Speciality areas include general medicine, general surgery, paediatrics, paediatric emergency, obstetrics, and gynaecology.

Medical schools in Qatar
- Weill Cornell Medical College in Qatar: Weill Cornell Medicine-Qatar (WCM-Q) is a branch of Weill Cornell Medicine of Cornell University, established on 9th April
2001 following an agreement between Cornell University and the Qatar Foundation for Education Science and Community Development. It is located in Education City, near the capital of Doha. WCM-Q has 318 students, 21 preliminary students, 97 pre-medical students, and 200 in its MD program.

- **College of Medicine, Qatar University**: Based on a commission by His Highness (HH) The Emir, the College was established in 2014 as a joint initiative by Qatar University and Hamad Medical Corporation. The college is meant to address the specific needs of the Qatari society and well-aligned with national strategies and priorities in healthcare education. The first batch of students completed their medical schooling and have joined various residency programs in 2021.

Residency programs in Qatar at Hamad Medical Corporation

Hamad Medical Corporation (HMC) is the largest government healthcare institution providing healthcare services to the community of Qatar. HMC sponsors 20 residency programs (Table 1). HMC is the first healthcare system in the region to achieve prestigious institutional accreditation by ACGME International LLC (www.acgme-i.org). To date, fourteen of HMC’s residency training programs have successfully achieved ACGME International LLC program accreditation (Table 1). Fellowship programs are under accreditation process, and already 10 programs got their accreditation from ACGMEI. In addition, HMC is accredited by the Joint Commission International (JCI) as an Academic Medical Centre. HMC is also a member of Qatar’s Academic Health System, with a tripartite mission to advance clinical care through teaching, education, and research, and is a primary affiliate of the two medical schools in Qatar: Weill Cornell Medicine – Qatar and the College of Medicine at Qatar University.

In addition to this, the Qatar Red Crescent Society (QRCS), together with Hamad Medical Corporation (HMC) and Palestine Red Crescent Society (PRCS), provides Emiri scholarships to Palestinian physicians for specialisation needed in Palestine.

| S/N | Program                             | ACGME-I status               | No of spots available (2020-21) | Duration of training (months) |
|-----|------------------------------------|------------------------------|---------------------------------|-------------------------------|
| 1.  | Internal Medicine                  | Accredited                   | 50                              | 48                            |
| 2.  | General Surgery                    | Accredited                   | 6                               | 60                            |
| 3.  | Paediatrics                        | Accredited                   | 25                              | 48                            |
| 4.  | Obstetrics and Gynecology          | Accredited                   | 5                               | 60                            |
| 5.  | Emergency Medicine                 | Accredited                   | 10                              | 48                            |
| 6.  | Family Medicine                    | Accredited                   | 13                              | 48                            |
| 7.  | Diagnostic Radiology               | Accredited                   | 8                               | 48                            |
| 8.  | Anesthesiology                     | Accredited                   | 8                               | 48                            |
| 9.  | Orthopaedics                       | Accredited                   | 4                               | 60                            |
| 10. | Urology                            | Accredited                   | 3                               | 60                            |
| 11. | Ophthalmology                      | Accredited                   | 3                               | 60                            |
| 12. | Otolaryngology                     | Accredited                   | 2                               | 60                            |
| 13. | Psychiatry                          | Accredited                   | 7                               | 48                            |
| 14. | Neurosurgery                       | Accredited                   | 2                               | 72                            |
| 15. | Cardiothoracic Surgery             | Non-ACGME International LLC  | 4                               | 72                            |
| 16. | Community Medicine                 | Non-ACGME International LLC  | 4                               | 48                            |
| 17. | Anatomical Pathology               | Non-ACGME International LLC  | 2                               | 48                            |
| 18. | Neurology                          | Non-ACGME International LLC  | 2                               | 48                            |
| 19. | Plastic Surgery                    | Non-ACGME International LLC  | 2                               | 72                            |
| 20. | Dermatology                        | Non-ACGME International LLC  | 2                               | 48                            |
Several residents in various programs have completed the residencies and are working as consultants in Palestine.

After four-five years of residency training in Qatar, the graduates will apply for the Arab Board of Health Specializations (ABHS) certification. Once successful, they will be eligible for a specialist position in HMC or pursue a fellowship within the organisation. A minority opts to pursue their careers abroad.

Anaesthesiology post-graduation training program at Hamad Medical Corporation
Before 1995, health services in Qatar depended on recruiting international postgraduate trained anesthesiologists to work as specialists - a middle-grade position - in the anaesthesiology department. These were medical graduates with three to four years of training in anaesthesia. Along their side, some clinical associates rotated in the anaesthesiology department under the supervision of senior anesthesiologists and later progressed to specialists and associate consultants, respectively, following a traditional apprenticeship model. The specialists evolved to become consultants and other senior roles based on the time spent in the department. This model had many problems. To name a few, there was significant variability with patient contact and exposure to cases leading to unpredictable skills development. It was also felt that the recruits’ main goal was financial gain rather than career development or service advancement.

In 1978 the Arab Board of Health Specializations (ABHS) was established, following the decision of the Arab Health Ministers Council, a subordinate to the Arab League. It aims to improve health services in the Arab world by raising the scientific and practical level in various medical specialities. The ABHS is responsible for establishing a certification procedure for each medical speciality, organising teaching and training sessions for the resident physicians in coordination with teaching institutions in the Arab World, and promoting the acquisition of continuous medical education and expertise. Currently, 17 specialities are enrolled under the ABHS in addition to the nursing speciality.

It was not until 1995 that the Arab board accreditation for the post-graduation training program came into existence. HMC anaesthesiology residency program got its basic structure as per the requirements set by ABHS in 2006, which included minimum primary curriculum and rotations. However, a major reshape of the anaesthesiology training curriculum development started when HMC got its institutional accreditation from ACGME-I in 2012, and the residency program got accredited in 2014 for an initial period of two years.

The anaesthesiology residency program started working on the requirements set by the ACGME-I and developed a competency-based curriculum. Clinical rotations were developed to fulfill the case log requirements in addition to rotation specific goals and objectives. The program and the department of medical education invested regularly in faculty development and evaluation methods. Following the initial two-year accreditation from ACGME-I in 2014, the anaesthesiology residency program received a renewed accreditation in 2016 for four years. Currently, the program is working on self-study for 2023 and expecting a site visit for accreditation.

Eligibility requirements to join anaesthesiology post-graduation training program
The Residency Program application for intake typically occurs between 1st August and 30th November for residents seeking to start their program the following year. The opening and closing dates of the intake are announced on the HMC website (www.jobs.hamad.qa) and on the online application portal. The post-graduation entry requirements have minor variations between Qatar-based medical schools and international medical graduates.

Graduates of Weill-Cornell Medicine Qatar (WCM-Q) and Qatar University College of Medicine (QU CMED) should possess the following:

i. Graduated, or will graduate by 30th June of the intake year, and

ii. Hold a valid Medical License or be eligible for licensure in their home country, the country where they are currently practising or in Qatar

Graduates from other medical colleges should fulfil the following criteria:

i. Graduated within the past six years from a medical school listed on the World Directory of Medical Schools (https://www.wdoms.org/).

ii. Have completed, or will complete by 30th June of the intake year, an internship training program or one year of postgraduate, hospital-based training in several primary medical specialities.

iii. Hold a valid Medical License or be eligible for licensure in their home country, the country where they currently practice or Qatar.

iv. Passed any one of the following required clinical examinations stated in Table (2).

v. Should meet the minimum listed score in any one of the following required English language proficiency examinations as listed in Table (3)

Anesthesiology clinical rotations overview
Clinical Base Year (CBY) – Before joining clinical anaesthesia, newly joined residents rotate in an integrated clinical base year designed for attaining competency in fundamental clinical skills. These rotations include internal medicine, general surgery, paediatrics, intensive care units (ICU), nephrology, infectious disease (ID) and cardiology, besides an introductory module to anaesthesia, anaesthesia clinics and post anaesthesia care unit (PACU).

Post Graduate Year 1 (PGY-1) resident year emphasises the scientific and clinical principles necessary to function as an
Table 2. Clinical Exams.

| Authority | Examination                                | Minimum accepted score |
|-----------|--------------------------------------------|------------------------|
| USMLE     | Step2 Clinical Knowledge (CK)              | Pass                   |
| IFOM      | Clinical Science Exam (CSE)                | Equivalent to the pass scores of USMLE |
| MCC       | Qualifying Exam (QE) Part 1               | Pass                   |

USMLE: United States Medical Licensing Examinations, IFOM: International Foundations of Medicine, MCC: Medical Council of Canada

Table 3. English Language Exams.

| Authority | Examination      | Minimum accepted score                  |
|-----------|------------------|-----------------------------------------|
| TOEFL     | PBT / PBT Revised| Prior scoring format: 550 Revised scoring format: 60 |
|           | IBT              | 87                                      |
| IELTS     | Academic level   | 7.0                                     |
| OET       | Medical          | 350                                     |

TOEFL: Test of English as a Foreign language, IELTS: International English Language Testing System, OET: Occupational English Test; PBT: Pencil Based Test; IBT: Internet-Based Test.

anaesthesiologist. PGY-1 anaesthesiology residents undergo a one-month orientation that includes a daily introductory lecture series and one-to-one attending supervision. This year is organised into discrete block rotations to ensure that every resident is exposed to all major areas of expertise. These rotations include anaesthesia for general surgery, urology, ambulatory surgeries, orthopaedic and trauma surgeries, acute pain services in addition to preoperative assessment and PACU.

Post Graduate Year 2 (PGY-2) year incorporates rotations in the subspecialties of anaesthesiology. These rotations include paediatric, obstetric, regional and neurosurgical anaesthesiology, critical care and chronic pain medicine. Each clinical rotation is accompanied by an organised didactic program to ensure that the resident becomes both clinically proficient and knowledgeable about the fundamentals of each subspecialty.

Post Graduate Year 3 (PGY-3) year is designed to give the resident all the exposure necessary to develop into a perioperative physician and anaesthesiology consultant by providing advanced training in transplantation/vascular, cardiothoracic critical care, as well as operating room (OR) management and non-operating room anaesthesia. PGY-3 residents are offered one to two months of dedicated research opportunities.

Post Graduate Year 4 (PGY-4) year entails mainly providing perioperative care for acute surgical and emergency cases. In addition, this year also includes critical care rotations and a month rotation in pediatric and obstetric anaesthesia, respectively. At the end of this year, residents would have met the ABHS certification requirements and are eligible for a training exit exam.

Usually, the number of working hours for residents in Qatar is 55–60 hours/week, averaged over four weeks. This compares well to other countries like 60 hours/week in Brazil, and 80 hours/week averaged over four weeks in the USA but slightly higher than the 37 hours/week averaged over one month in Denmark, 48 hours taken over 17 weeks in the UK or the 50 hours/week in Switzerland. It is essential to view these hours as an indicator of work-life balance and accomplish the minimum required time for adequate training considering the caseload and mix in every training institution. The program keeps close monitoring of duty hours for the benefit of residents and the patients under their care.

Assessment tools

A variety of tools, such as workplace-based assessments that includes mini-Clinical Evaluation Exercise (mini-CEX), Direct Observation of Procedural Skills (DOPS), case-based discussions, Chart Stimulated Recall (CSR) and daily encounter evaluation are applied throughout the residency years. Furthermore, In-Training Examinations (ITE) help measure the resident’s medical knowledge progress throughout their training. Upon completing one year of residency and at the end of the
training years, residents sit certification examinations arranged by the ABHS. The Arab Board Exam - as it is commonly known - is comprised of two parts:

- Part 1 Exam (Basic MCQ)
- Part 2 Exam is further subdivided into Part two MCQ and Part two OSCE/VIVA, respectively.

Clinical teaching and continuous professional development

Continuous professional development (CPD) activities serve as a platform that provides a means for the anaesthesia provider to stay up to date and strengthen competencies for safe practice. At HMC, there are ongoing CPD activities that entail current updates and guidelines in anaesthesia and a discussion of interesting cases. These include weekly journal clubs prepared by residents and mentored by senior anesthesiologists, monthly morbidity and mortality sessions, specialty rounds and other forms of continuous professional development activities. The activities are carried out in person and on e-platforms to facilitate staff presence and participation.

Qatar board for medical specialties

Qatar Board for Medical Specialties (QBMS) was launched in 2020, under the auspices of Ministry of Public Health. QBMS will certify physicians and provide credentials to physicians “who demonstrate exceptional expertise in a particular specialty of medical practice.” The first seating for the QBMS Part One exams was in September 2021.

Post anesthesiology residency opportunities

HMC provides a series of fellowship opportunities after the residency training period is completed. The fellowships in different fields of anaesthesia include neuro-anaesthesia, obstetrics anaesthesia, paediatrics anaesthesia, regional anaesthesia, chronic pain management, critical care, and advanced anaesthesia. The duration of training is three years, during which fellows are exposed to and gain enough clinical acumen in their chosen domain of choice. The number of fellowships available in each subspecialty varies annually, depending primarily on the number of enrolled fellows and the job planning of the department.

Another option to pursue after completion of residency training is to apply for a specialist position in HMC or other countries in the area, especially members of the ABHS and Arab League where-in specialist anesthesiologists practice independently.

Pursuing residency or fellowships in the US is another option for residents who are certified by the Education Commission for Foreign Medical Graduates (ECFMG) of the United States of America (USA).

A portion of residents applies for certification by the European Society of Anesthesiology and Intensive Care (ESAIC) or other country-specific certification exams, e.g., Fellowship of the Royal College of Anesthetists (FRCA) UK. These exams aid residents to register in respective medical councils and supports their application for training jobs in European constituencies.

Research and quality improvement

Research and quality improvement is an integrated part of anesthesiology training. It starts from the CBY training period, where residents have one block on quality improvement (QI) and spirals throughout the following years. This encompasses 12 introductory lectures on QI. Further, all residents complete the introductory module provided by the Institute for Healthcare Improvement (IHI) course. Residents get an opportunity to work with the QI team of the department. They are encouraged to generate QI ideas, get involved in the planning, data collection, analysis, and dissemination of results.

All residents complete the Collaborative Institutional Training Initiative (CITI) courses before joining or initiating their research. Mentors are available as senior faculty to supervise or involve residents in their projects. Residents have one specific block in research, which they plan with the research faculty. In this block, they can write a proposal, carry out clinical studies, prepare a manuscript, or write a book chapter. The faculty evaluate the block on set criteria discussed at the start of the block.

Future challenges and perspectives

Competency-based education in anesthesiology (CBME).

There is no clear evidence in medicine that quality and patient safety will improve with a milestone-based education program; it seems intuitive, however, that it might. Recent advances in the field of anaesthesiology necessitate more time for skill development and mastery. Advanced techniques such as Trans-Esophageal Echocardiography (TEE), ultrasound imaging for nerve blocks and catheter placement, complex procedures in the pain clinic including radio-frequency ablations, stimulator implants, and ultrasound-guided neurolytic blocks require more time for skill development and mastery. Removing time from the equation opens the door to expanded experiential learning in the operating rooms, clinics, intensive care units, and simulation laboratory. However, CBME makes educational and human resources planning challenging, if not impossible. Another challenge is in finding the appropriate assessment tools to measure the specific outcome. CBME can be understood as a response to the problem of not having concrete information about if and how our learners are becoming competent.

Making the transition.

Adopting CBME involves adopting flexibility and adaptability into education programs to account for resident variations in skill achievement. Autonomy transition, technical skills and exchange programmes that help trainees gain experience in other countries to expose them to a different healthcare system and develop further experience in their field of interest would be an excellent initiative to implement. Good theoretical teaching alongside excellent practical teaching, primarily hands-on with simulations, should be considered. Mandatory research methodology training and involvement in QI initiatives for gaining better insight into perioperative care should be adopted. The curriculum needs to encourage inter-professional skills and soft skills like empathy/compassion.
and leadership skills, which allows to integrate humanism and compassion into a formal curriculum to improve perioperative outcomes. Regular surveys of trainers, trainees and administrators will generate essential tools to uncover needed improvements for medical training.

Conclusion
The postgraduate anaesthesia training program in Qatar -though relatively young- has already achieved significant milestones. Established in a growing metropolitan city, the program has attracted international trainees from all corners of the globe. It is the first anaesthesia program to achieve accreditation from the ACGME-I outside the USA. Challenges facing the program are like other sister programs. CBME is a cornerstone in the program, and multiple opportunities for careers and sub-specialisation exist upon completion of post-graduation.

Author contributions
Sumayya Aboobacker is an anaesthesiology resident in HMC. Sohel Ahmed, MD, FCARCSI and Neeraj Kumar, MD, are anaesthesiology consultants and residency faculty members of the Department of Anaesthesiology ICU and Perioperative Medicine in HMC. They are heavily involved in residency education and curriculum reform. Abdullatif Al Khal is the Chief Medical Officer and Director of Medical education in HMC.

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