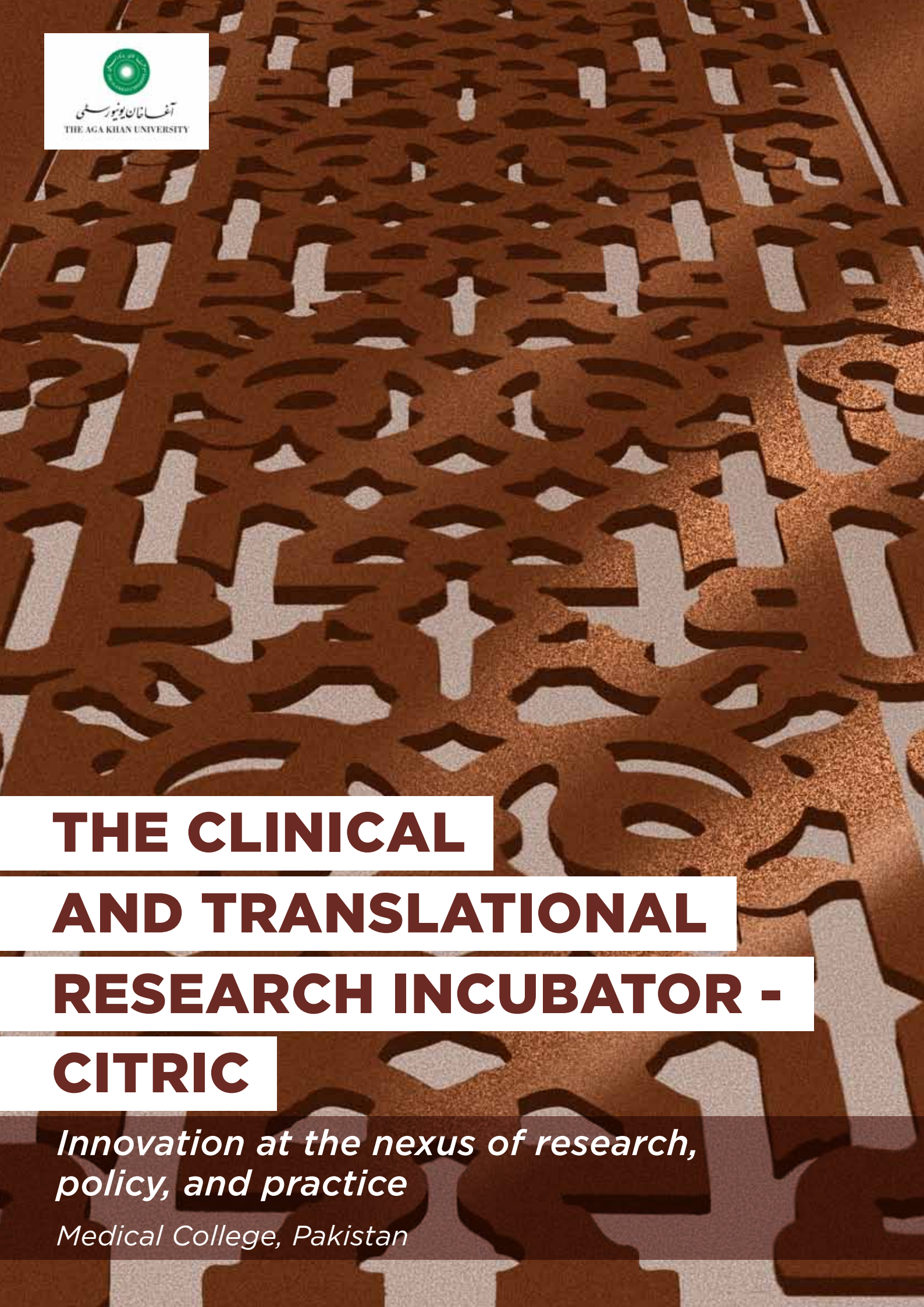

آغا خان یونیورسٹی
THE AGA KHAN UNIVERSITY

THE CLINICAL AND TRANSLATIONAL RESEARCH INCUBATOR - CITRIC

Innovation at the nexus of research, policy, and practice

Medical College, Pakistan

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Introduction

The Clinical and Translational Research Incubator (CITRIC) was established in 2020 as a hub to drive research productivity at AKU's Medical College (MC,P). Dean Adil Haider arrived at AKU in 2019 as the former Kessler Director of the Center for Surgery and Public Health at Harvard Medical School/Brigham and Women's Hospital, bringing with him deep research experience and an entrepreneurial spirit to revitalize research at MC,P. While MC,P had historical success in research, a renewed call from University leadership to become research-led created space for the Dean's idea of CITRIC to bring together faculty from across disease burden areas. In fact, one of the primary outcomes of CITRIC in its 5 years has been its ability to break silos in a large institution that has many outstanding specialty and sub-specialty domains.

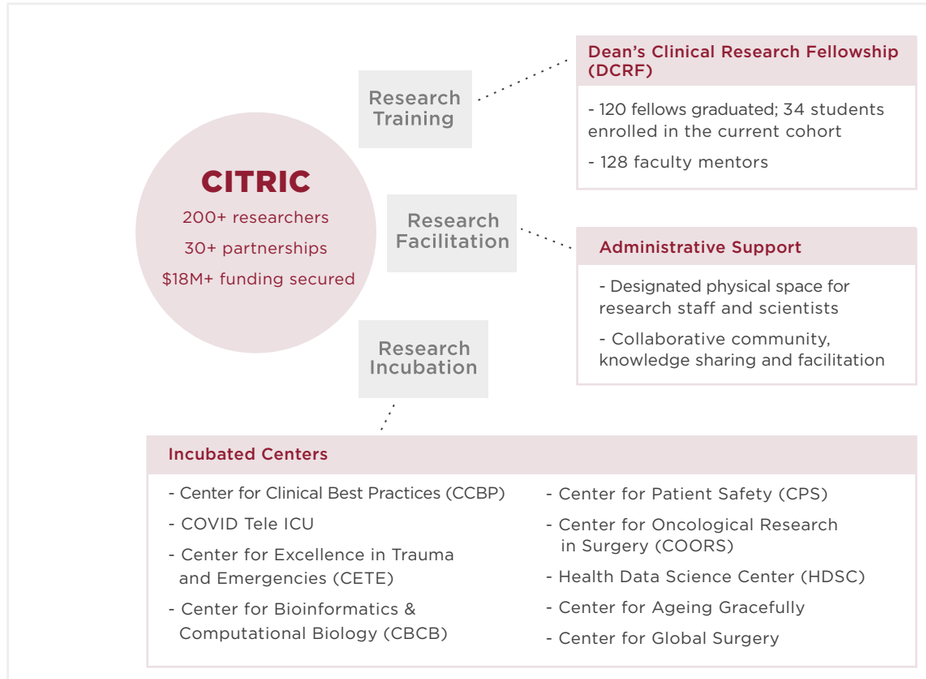
This cross-disciplinary approach to research has created incredible results beyond increased research productivity and grants secured. In particular, the policy impact and engagement with Pakistan's provincial and federal governments, has been a natural pathway for the majority of the 9 CITRIC centers. The Center for Clinical Best Practices launched a Manual of Clinical Practice Guidelines to improve patient care for millions of people in Pakistan with the support of Prime Minister Shehbaz Sharif. The Tele-ICU initiative works to build critical care capacity in health-care facilities, and was established as a rapid response to a call from the federal government during the initial stages of the COVID-19 pandemic. The Center of Excellence for Trauma and Emergencies takes a multistakeholder approach to saving lives, leveraging the power of Pakistan's youth and working together with the Ministry of Education to ensure a system wide approach to training. The Health Data Science Center has worked in collaboration with provincial ministries to build data analysis capacity and create dashboards to improve the usability of health data in Punjab, Sindh, and beyond.

Building workforce capacity has been another deliberate mission of CITRIC centers. The Center for Bioinformatics and Computational Biology grew out of an initiative to establish a high-quality biorepository in a low-middle-income country. It has a continued focus on the development of individuals that can analyze important data including the genomic surveil- lance of pathogens. The Center for Global Surgery is working to develop a cadre of surgeons who are competent in the conduct of essential and emergency surgical procedures and can enhance systems for the delivery of surgical care in resource constrained environments. Our Center for Patient Safety takes a scientific approach to understanding patient safety challenges in Pakistan and enabling research-driven change around this.

Human capital development and developing the next generation of researchers has also been a key focus of the Dean's Clinical Research Fellowship. This program—a flagship initiative of CITRIC, pairs recent AKU MBBS graduates with faculty to gain hands on experience in clinical research in a specific area of interest. Mentorship, teaching sessions and workshops are also part of this skill building and career development initiative.

The Center for Oncological Research in Surgery envisions elevating surgical oncology through premier research, catalyzing innovation in a resource-limited landscape for a brighter cancer-free future, while the newest Center for Ageing Gracefully takes an integrative approach to co-developing an ecosystem of care that is person-centered, evidence-based, and contextually grounded for an often-neglected population.

Finally, CITRIC has also been a key part of building research infrastructure at AKU. It hosts more than 96 work stations and provides support to faculty to help advance their research. 5 years ago CITRIC was envisioned as an innovation hub, and today its catalytic impact extends beyond advancing research. Today, CITRIC's biggest success is that it has enabled faculty to create pathways for change outside of AKU's pink walls, in the true spirit of the institution's values.



Dean Adil Haider Clinical Research Fellowship

The Dean Adil Haider Clinical Research Fellowship (DCRF) is an integral part of CITRIC and was established in 2020 as a one-year fully funded fellowship for recent AKU medical graduates (MBBS), seeking to gain hands on experience with clinical research. Recently renamed as the Dean Adil Haider Clinical Research Fellowship to honour Dr Haider's vision for creating the next generation of clinician-researchers, he reflects on the thought process behind DCRF:

"At AKU we are invested in the impact our students will make over the course of their career. The DCRF was set up with a specific aim to help MBBS graduates build their clinical research portfolios by actively pairing them with faculty in their area of research interest. While this approach creates an opportunity for learning and development, it also provides a platform for hands-on mentorship. We continue to receive an incredible response to this initiative through number of applicants each year and feedback received. I am thrilled that the fellowship helps shape careers of young doctors beyond clinical practice, and creates early career researchers, who are already actively contributing to our national health sciences ecosystem."

DCRF is a competitive program with over 120 graduates and 128 Faculty Mentors. Fellows have worked on over 400 publications, and on high impact projects in the areas of patient care, public health and evidence-based medicine. Projects worked on include those at the peak of the pandemic, in the area of digital health, and on disease burden registries. Fellows are also trained in a range of technical skills as well including biostatistics and research ethics, to ensure strong knowledge of the fundamentals of research.

A Fellow's Perspective:

"The Dean's Clinical Research Fellowship has been a transformative experience in my post-graduate journey, allowing me to grow from an amateur researcher to a confident and capable research scientist. The fellowship provided me not only with structured guidance and hands on learning, but also leadership skills that gave me the autonomy to come up with novel ideas and lead my own projects.

What sets this fellowship apart is its strong emphasis on mentorship and collaboration. Working alongside dedicated faculty not only strengthened my research skills but also helped build relationships that have supported my journey towards further postgraduate training. As the Dean's visionary initiative, this fellowship has had a remarkable impact. It continues to empower recent medical graduates, nurturing their academic potential and opening doors to future success. I'm incredibly grateful to have been part of such a meaningful and impactful initiative."

- Aiman Amir, Class of 2023

Center for Clinical Best Practices (CCBP)

CCBP was an idea whose time had come, and conditions were ripe for its incubation.

Date of Inception: **June 2020**	Associate Directors: **Drs Mohsin Mustafa & Samar Fatima**	People: **8**

With world-class experts trained at the best local and global institutes, and a treasure trove of 40 years of institutional learning, embarking on this journey of local clinical practice guideline creation was inevitable. The Manual was the idea; the Center became the eco-system around it that gave it life and through which the plan was executed, as envisioned by Dean Haider with the support of senior AKU leadership.

The completed Manual is only the tip of the iceberg visible to everyone; years of hard work and effort have gone in behind the scenes, that many a times go unnoticed. The first task, taken on by the founding director Dr Sarah Nadeem and Manager Nashia Rizvi, was building a relationship with the US-based Evidence Foundation, who then created a process specially for AKU. A simpler process was required since CCBP did not have the kind of extensive financial resources available for the development of one guideline as is the norm in the West. After a year of work with the Evidence Foundation, the green light was given for the next phase: generating buy-in at AKU and creating champions of this work internally.

Through building connections with faculty and training them in the guideline development process, 150 faculty members came on board to work on the Manual; their diversity of expertise lending it the strength it needed. Though there is indigenization in all fields globally, it is not always easy, and requires a deliberate effort to look less towards the Global North and design initiatives and conduct research for and within local context. This requires both an understanding of indigenous challenges and knowing the reality of working with limited resources. One example is Thyroid disease; instead of multiple costly tests being ordered simultaneously, the guideline was amended to include only one preliminary screening test with others only conducted in cases that need further investigation.

"When I first heard the idea in Dr Adil's office, it was a no-brainer, and I wondered why we hadn't done this before. I gravitated towards it because I enjoy working with multiple stakeholders, and I knew that if we did this well it will take on a life of its own much like the 10th edition Oxford manual I used in my own medical education. The joy of knowing that one day, the thing you create will benefit people long after you are gone is what drew me to it."

Associate Director, Dr Mohsin Mustafa

However, creating the Manual was just half the battle. Getting it into the hands of the right people and ensuring that they use the material is the other half. AKU's goodwill and credibility coupled with the quality of work and the strength of networks built along the way, resulted in a positive response both within and outside AKU. The internal and external national advisory boards involved from the start propelled this forward, while the associate editors worked tirelessly on their own time to make a good manual, great. The launch event graced by the Prime Minister and senior government leaders enhanced the Manual's profile further allowing the team to disseminate deeper into the healthcare network and make it a part of the national discourse on treating diseases.

PARTNERSHIPS

- MOU with armed forces, rolling it out to their healthcare footprint nationally
- PMDC enabling adoption by reaching out to all registered doctors
- CPSP adding guidelines as part of their evaluation and monitoring tool
- Multiple medical colleges and universities across Pakistan
- Health Ministry of Sindh – developing a concept note to train all physicians in the government sector in these guidelines
- Evidence Foundation
- National Advisory Board

NEXT STEPS

- Ramp up dissemination efforts (social media, roadshows, conferences, collaborations, video lecture series, publications)
- Children's Health Manual
- Women's Health Manual
- Consistent update of existing guidelines with algorithms
- Eventually work towards a patient centered manual, with possibility of linkages with tele-health

14 Publications, 12 in the pipeline

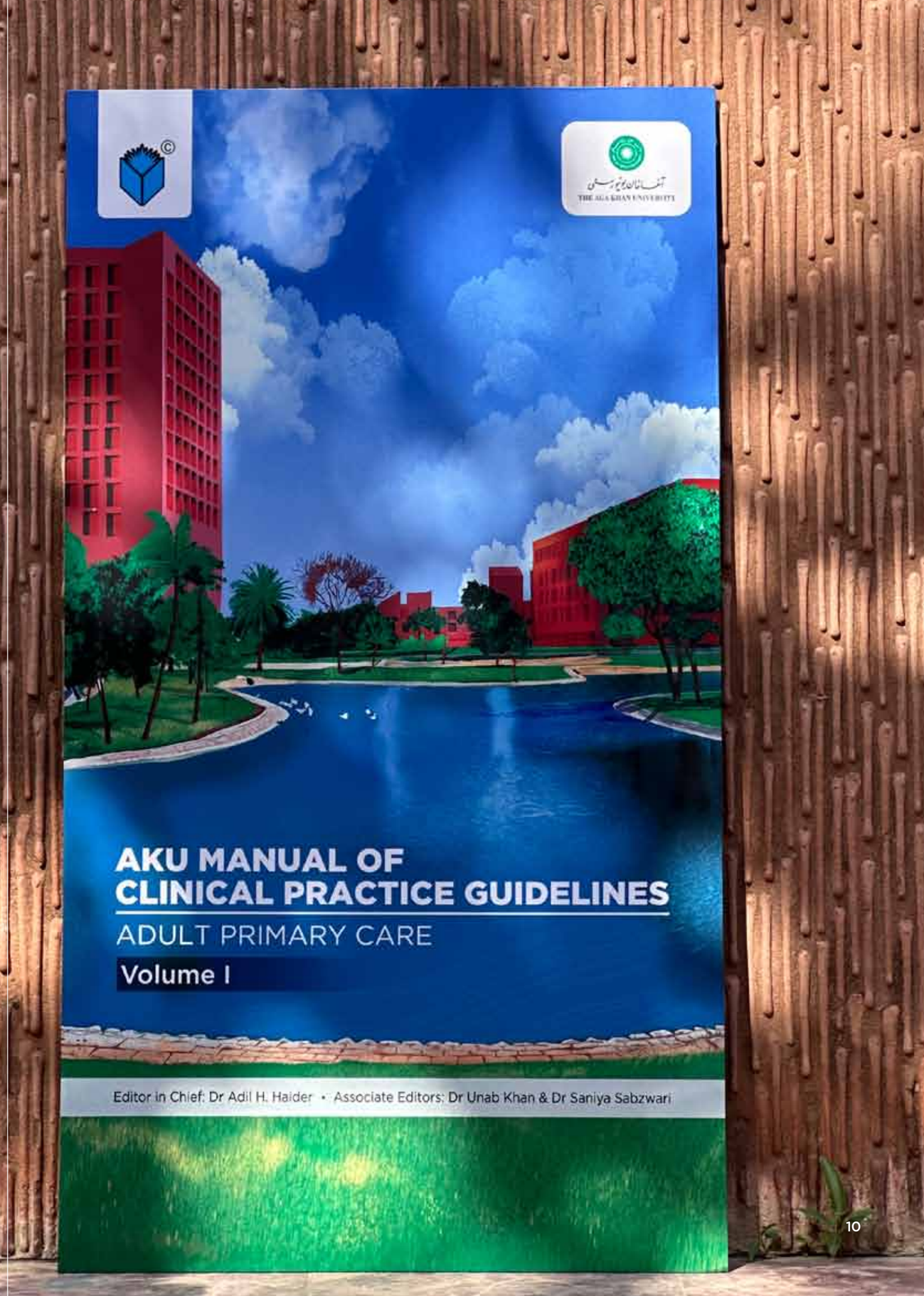
1st Grade Center in South Asia

Total digital users 8500+

The development of the AKU Manual of Clinical Practice Guidelines has been a large-scale effort of over 150 co-authors from AKU, to create a context specific, evidenced based manual for 140 of the most prevalent diseases in Pakistan. A free digital version has been developed in partnership with AKU's Digital Health Resource Center to ensure accessibility for healthcare providers nation-wide. The CCBP has worked in collaboration with the U.S. Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) Network, to ensure a rigorous approach to guideline development, and is the first GRADE endorsed evidence center in the region.

The story of the Center for Clinical Best Practices is one of local adaptation, but it is also a story of access. Not only do the guidelines improve quality and cost of care, they provide access to knowledge that may not be readily available to healthcare providers, especially in remote low resource settings. More importantly, the Manual provides a ready-made, validated, credible solution for practitioners who may not have access to the time and resources required to adapt guidelines on their own. Becoming a bridge that allows others to access the expertise of global entities like Evidence Foundation or local institutions like the PMDC is where its real impact lies.

It is an effective blend of internal expertise generated over decades at AKU translating into unique context-based solutions that have direct impact on the health outcomes and healthcare delivery for the communities whose standard of living we have committed to improving.



Center for Patient Safety (CPS)

The CPS is the brainchild of AKU Faculty and Alumni, in an effort to take a scientific approach to understanding patient safety challenges in Pakistan, and enabling research-driven change around this.

Date of Inception: **September 2020**	Director: **Dr Asad Latif**	Number of people: **5**

When Dr Asad Latif, Chair, Department of Anesthesiology and Director of the Centre for Patient Safety was approached by AKU MC Alumni about establishing a Centre for Patient Safety, he saw an opportunity to pioneer an under-researched field in Pakistan, and make a difference in healthcare outcomes across specialties. With a generous Class Gift from the MBBS Class of 1993, the Centre for Patient Safety was CITRIC's first center and a platform to push health systems to ask the right questions. The Center aims to understand the underlying drivers for quality and safety of care in our context, so that interventions lead to meaningful improvements that are lasting and locally grounded.

The Center for Patient Safety is a multi-disciplinary research, teaching, learning, and advocacy Center which aims to:

- Investigate conditions affecting patient care and promote systemic approach to patient safety
- Advance the University's research capacity, teaching and learning excellence around patient safety
- Share knowledge with stakeholders in healthcare globally

At the CPS, research in the area of patient safety seeks to improve patient care, but it does not look solely at factors such as accreditation or standardized benchmarks. The center dives deeper and studies people and practices to understand how systems work at an individual and organizational level, as well as institutional culture to understand how healthcare workers can be stakeholders in improving/optimizing safety and impacting outcomes. This includes drawing on research to understand how best to get individuals to adhere to standards, how you measure adverse events, and how you create an environment where people can communicate freely.

Incidence of Adverse Events	**RESEARCH FOCUS AREAS**	Impact of Academic Interventions
Clinical Outcomes	Safety Culture	Patient Perspective of Harm	Medication Safety

7 Publications, in high/medium impact journals. **Submitted:** 1, **In Progress:** 9

Grants Acquired: 1 (Rs. 3,861,151)

Major projects include an initiative funded by a grant from the World Health Organization to conduct a study on the current state of patient safety in Pakistan. As Pakistan does not have comprehensive systems and processes in place—such as medical records, pathways do not always exist for individuals to document and report adverse events. Cultural factors are also important to consider, with patients hesitant to assume a role in patient safety or advocate for themselves. Therefore, the center's advocacy around patient safety is critically important at both a system and individual level. Training healthcare providers has been another way to advance patient safety, with the CPS having trained over 1990+students & healthcare providers to date.

Dr Latif reflects on a major challenge of Pakistan and other low middle income countries, "*we are operating in a low data and transparency culture, making it difficult to understand the true state of care and its quality. To address this, we need to come up with novel approaches incorporating a combination of chart reviews, interviews, direct observations, focus group discussions, and patient interviews to start to understand and categorize our patient safety challenges.*"

Applying the lens of patient safety to healthcare reform ensures a patient-centered approach to improving quality of care at a national level. The CPS' evidenced based approach combined with a quest to understand local context and culture for long-term change, has the power to transform every patient's healthcare journey.

Tele-ICU project

The Tele-ICU initiatives build capacity of healthcare workers across Pakistan, starting first during the COVID-19 pandemic to address critical care needs at a national level.

Date of Inception: **May 2020**	Director: **Dr Asad Latif**	Number of people: **23**

The Tele-ICU project was created as a response to the COVID-19 pandemic, with the particular goal of meeting critical care needs at a time of urgency. At the start of the pandemic, the capacity of healthcare workers and equipment to manage critical care patients was extremely limited. Dr Asad Latif, Director of the Tele-ICU project notes that at that time, Sindh only had approximately 45 ventilators available at public sector hospitals, with the national number being less than 500. And while the number rapidly grew by almost 10-fold due to need, there was a critical question of who was going to operate these given the need for specialized training and a limited number of ICU physicians and ICU nurses available nationally.

The Tele-ICU project was a grassroots initiative that responded to a national call for support to strengthen ICUs, and started with a tweet from the former state minister for health, Dr Zafar Mirza. Established in CITRIC, and with support from the Gates Foundation and the Dawood Foundation, AKU was able to provide remote ICU consultations to patients across the country right from the start of the pandemic and now provides remote consultations in other areas of high need such as pediatrics and neonates. The initiative also worked closely with the government to assess public sector hospitals to support policy and planning for critical care.

Training has been one of the major pillars of the Tele-ICU project. One of its biggest successes continues to be the impact of educational training, including ongoing courses focused on the care of critically ill patients: Over 8,000 individuals attended online courses during the pandemic, and about 50 people continue to attend general critical courses on a weekly basis. A community-based approach to training has expanded its reach with academic ICU teaching rounds broadcast nationally to residents and fellows not just from critical care but also from other disciplines, with over 300 people attending on a regular basis.

While the initiative started with a focus on COVID, it now offers low-resource peer-to-peer tele-ICU service 24x7 direct support to the clinical care of ICU patients. This initiative has built local capacity across 50 cities in Pakistan, from Booni to Jamshoro, working with 85 institutions and over 600 physicians for sustained consultation engagement.

4 Publications, in high/ medium impact journals

Grants Acquired: 3 ($1M and Rs. 5,027,212)

During COVID, the Centre:

Trained **21000+** HCWs	Impacted **2628+** patients	Made **33,084** management recommendations	Conducted **7224+** Tele consultations

Center for Global Surgical Care

A multi-stakeholder center with the Departments of Surgery, Family Medicine, Ob-gyn, and Anaesthesia, that now resides in CITRIC.

Date of Inception: **2019**	Director: **Dr Sadaf Khan**	Number of People: **6**

It all began with the theme for the Annual Surgical Conference, and as the committee headed by Dr Sadaf Khan delved deeper into the theme of global surgery, the significance and need to develop this area further at AKU arose. With the encouragement and support of senior leadership, especially Dr Haile T. Debas, known as the father of global surgery, the center was established.

PILLARS					
Research	Education and Training	Advocacy	Collaboration	Service	Delivery

Global Surgery has historically been regarded as outside the realm of public health due to the high cost and infrastructure needs associated with it. Over time, the high morbidity and mortality associated with surgical diseases along with the realization that surgical infrastructure has multi-purpose use, caused a shift in perspective. The Lancet report on the parameters needed for effective surgical care resulted in many western universities and centers taking up the mantel of global surgery, but most of that work applied to different contexts and populations. Due to our unique needs and constraints, we needed local guidelines and solutions with a specific focus on rural populations.

12 Publications, in high/ medium impact journals

Grants Acquired: 2 (Rs.3,600,000)
Awaiting: 1

Rural Surgery Leadership Programme (RSLP): a one-year training programme at AKU where a general surgeon is trained in specific additional clinical skills as well as skills that relate to management of healthcare. For four months they train at AKU secondary hospitals and external institutions such as Indus Hospital, while completing two courses through our graduate offerings, and for the next four months they train and practice at our hospital networks in Gilgit-Baltistan to truly get exposure to a resource-constrained environment. The remaining four months consist of an elective where they are embedded in the clinical practice for two months and with an administrator of a healthcare system for the last two months.

"The Center is also working with the Gates Foundation and Dr Sameen Siddiqui to upskill and improve the health system in Sindh. It has been subcontracted to work on the TandoAllahyar hospital to upskill the emergency room and we hope this can create long-lasting impact that can be cloned and replicated in multiple areas. We have also conducted a facility survey of 12 hospitals in Sindh where we look at out of pocket expenditure and impact on a family's household income when a patient goes for surgical care to a public hospital."

Dr Sadaf Khan, Director

NEXT STEPS

- **Rectal Cancer**

The incidence of rectal cancer in younger individuals is higher than the global norm, with a higher incidence of an aggressive sub-type. Through collaborations with multiple external institutions like Shifa Hospital, Shaukat Khanum, Lahore Medical Center etc., a snapshot was created of the epidemiology and management of rectal cancer. The plan is to create an on-going prospective registry in addition to establishing standardized, template-based radiologic and pathology reporting for that particular disease.

- **Laparoscopic Surgery**

Trainees coming out of Pakistan's main teaching tertiary institutes have varying skills related to laparoscopic procedures. A needs assessment is required before developing a training program where participating institutions commit to including this training for their students before they complete the programme. There is a positive response and buy-in from other teaching tertiary institutes for this initiative.

- **Build and strengthen partnerships at the local and national level**

The Center for Global Surgical Care is uniquely positioned to affect how surgical care is approached in Pakistan. Its efforts are focused on enabling accessible, safe, affordable, quality, and holistic surgical care for all, with the eventual goal of embedding surgical care in public health systems. Pakistan's SOAP plan and the addition of surgical care in the Universal Healthcare priorities is a promising step in this direction.

Center of Excellence for Trauma and Emergencies

The CoETE addresses one of Pakistan's leading healthcare challenges, leveraging the power of community to do so.

Date of Inception: **May 2020**	Director: **Dr Junaid Razzak**	Number of people: **34**

The Center of Excellence for Trauma and Emergencies (CETE), established in 2020, was born out of a need to respond to the high rates of individual and population-level emergencies and injuries in Pakistan. Leveraging AKU's history as a pioneer in the field, with the first organized residency program in Emergency Medicine in Pakistan and as a designated World Health Organization Collaborating Centre in Emergency Medicine and Trauma Care, the CETE works to empower communities through education/training, research and policy initiatives. CETE was envisioned to be multidisciplinary and works across various disciplines in health, education and social sciences, bringing together a range of partners, including internal AKU departments, hospitals, and health centers, Institute of Educational Development, AKU Examination Board, AKU campuses in East Africa, AKDN agencies such as Aga Khan Agency for Habitat and other civil society organization, and the government.

Flagship Initiative: The Pakistan Lifesaver's Program

The Pakistan Lifesaver's Program (PLSP) is one of the CETE's flagship programs, with its roots in community advocacy, training and empowerment, leveraging Pakistan's enormous youth population to make change. The PLSP aims to train 10 million regular citizens/bystanders across Pakistan in basic life-saving skills of CPR and Bleeding Control: Even a 1% reduction in these deaths will result in over ten lives saved every day in Pakistan. And while this is a large-scale, multi-year training effort, it goes hand in hand with a deliberate effort to build civic sense and civic responsibility, so that communities know that they are important contributing members of society that have the potential to change the trajectory of Pakistan's mortality and morbidity numbers.

Founding Director, Dr Junaid Razzak speaks to the gap in the emergency response system in Pakistan, and the desire to strengthen the Chain of Survival. In several studies, the outcomes of cardiac arrest in Karachi showed zero percent survival. The need to equip bystanders with the skills to perform CPR for example, has a chance to change these outcomes. It allows time for the individual to be transported to a hospital/health facility, and to give the correct information to the emergency service you are contacting, which could make a difference of survival.

The government has been a critical partner in this initiative to ensure scale and reach, with the Ministry of Education including the training program in the curriculum and textbooks in Sindh and AJK from Class 6.

To date, PLSP has trained 500,0000 people across Pakistan. Additionally, over 500,000 children have been exposed to lifesaving skills through CETE-led changes in school curricula.

Initiative 2: Responding to climate change related disasters and emergencies

Lady Health Workers (LHW) have played a pivotal role in providing primary care to communities in Pakistan since the early 1990s. With more than 100,000 LHWs in Pakistan, these individuals connect their community with important health education ranging from family planning to immunization. Dr Razzak believes they have an important role to play in disaster management at the community and population level which is where CETE's latest initiative comes in; leveraging this trained network of community health workers to respond to the growing challenges of climate change. In the instance of floods, existing networks can be used to prepare communities that live with very limited resources, sometimes in geographically challenged areas.

This initiative will start in Benazirabad and Sangar with 2000 Lady Health Workers, and expand across the region. It is embedded in community health principles and aims to be an example of how to combat climate change through grassroots level engagement, among some of the highest-risk and most under resourced population of Pakistan and the Global South.

Initiative 3: FEAMER (Feasibility and Efficacy of Ambulance-Based mHealth for Paediatric Emergencies) Study

The FEAMER study uses tele-medicine to transform care for critically ill children during ambulance transportation

"What differentiates AKU from other Universities is our focus on community health, which is part of the DNA of the institution. Nobody wants their loved ones to die or have poor health outcomes, and AKU's focus on public health means that through programs like these, we can empower more people through combatting technical challenges and increase community participation, all while being at the cutting edge of healthcare. That is the purpose of the healthcare system after all: to save."

Dr Junaid Razzak, Founding Director, CoETE

32 Publications, in high/medium impact journals

Grants Acquired: 9 ($4.3M)

Health Data Science Center

The HDSC takes us into the future, bringing together cross-disciplinary experts to understand Pakistan's disease burden and drive a movement of data driven decision-making across the healthcare system.

Date of Inception: **December 2020**	Director: **Dr Zainab Samad**	Number of people: **15**

The Health Data Science Center (HDSC) was established in 2020, inspired by Dr Zainab Samad's experience with a similar center at Duke University, and an understanding that AKU and Pakistan had a wealth of health data, with an opportunity to curate, analyse, and utilize it for advancing patient care and quality. AKU had both the infrastructure and data to build a health data eco-system, but required an organized effort to map out how to leverage institutional health data to support University goals and population health needs. The "A-HA" moment came when Dr Samad was working on Duke's data bank for cardiovascular diseases, and was able to see the power of a particular data set, which sparked an equity debate on how a single disease can look different in different people.

AKU's Health Data Science Center is a cross-cutting, interdisciplinary center that brings together individuals from different backgrounds including students, clinicians, data scientists and public health researchers to look at health data through distinct lenses. Key areas that the HDSC looks at include:

1. Large trends in diseases at a country/regional level: If we understand disease patterns, we can inform policy, and help ensure that resources are allocated in an evidenced based way, which is particularly important in resource limited settings.

2. Hospital and health system level data: If we can understand why a patient did or not do well, we can predict outcomes, which then informs patient care in a significant way.

"The value of real data and understanding diseases patterns is understanding who is truly coming through the door, so that you can help each patient. Data science is a means to an end, (we work to understand) how we can use it to help Pakistan tackle its problems."

Dr Zainab Samad, Director, HDSC

22 Capacity Building Initiatives

50 Publications

Grants Acquired: USD 2,273,123

PARTNERSHIPS

Key initiatives of the HDSC have been successful because we truly believe in mission-centered partnerships. Together we have:

1. Conducted a burden of disease estimation through disease modelling with the Institute for Health Metrics and Evaluation (IHME). Work with the IHME includes estimation of Pakistan's dengue burden, the first national mobile survey on non-communicable diseases, and a verbal autopsy study for cause of death assessments.

2. Collaborated with the Duke Institute for Health Innovation on qualitative analysis of artificial intelligence adoption in the Pakistani healthcare context, development of a machine learning model for predicting in-hospital mortality and a feasibility study on adapting the Sepsis Watch model from high-income countries for local healthcare settings.

3. Partnered with Shaukat Khanum Memorial Cancer Hospital and Research Center and Chughtai Labs on estimating the burden of dengue in Pakistan, and with Rehman Medical Institute and the National Institute of Cardiovascular Diseases to estimate Pakistan's ischemic heart disease burden.

4. Supported the Punjab Government in the areas of data analysis and developing dash boards to improve usability of data for informed decision making. The Center also works with the Sindh Government to support implementation of the Electronic Medical Record system in districts of Sindh.

KEY INITIATIVES

1. Contributions to Pakistan's first ever national AI policy of Pakistan

2. Curriculum design for Masters in Health Data Science, series of workshops on AI and disease modelling

3. AKU Data Curation: Acute myocardial infarctions analysis using 30 years of AKU data, Departmental dashboards (in-hospital mortality, cancer registry) , Clinical data warehouse (2011-2023 data) (3.8 M patients, 179.8 M entries)

4. Public Health Initiatives: Filling data gaps (Mortality surveillance in Karachi, First national level digital NCD survey)

5. Projects include national cervical cancer burden estimation and familial hypercholester-olemia prevalence

Center for Oncological Research in Surgery

When like-minded people come together to support a vision based on identified needs and potential for great impact, a center like COORS is born.

Date of Inception: **July 2023**	Director: **Dr Ather Enam**	**Number of** People: **10**

Dr Ather Enam, Director of COORS and Professor of Neurosurgery, conducted a 32 center Pakistan Epidemiology Brain Tumor Study; the results were quite concerning. There was a loss to follow-up rate of 41% which meant that there was no data regarding what happened to almost half of the population afflicted with this disease. The lack of an updated cancer registry, and huge gaps in patient centric data, despite excellent work happening in Oncology at AKU, was the impetus for this center.

A designated center was needed to conduct focused research that generated evidence to respond to some of the pressing issues in the field. Evidence not for its own sake, but to drive specific goals of precision medicine, patient centered care and national policy changes. And our esteemed donor Mr Aziz Shariff provided the seed funds required to get it off the ground.

Oncological research is the most funded and rigorous research in the world. In Pakistan, despite witnessing devastating rates of the disease, we are not mapping our population molecularly, genetically, culturally, or environmentally to establish cause and effect.

"Cancer research centers around the world are actively engaged in oncological research but that is based on their own populations. We need to understand our specific disease pathways and genetic make-up unique to Pakistan. This will ensure our representation within global guidelines, catering to a huge Pakistani diaspora worldwide. We focus on understanding cause, tracking incidence, improving treatments, and addressing patient and caregiver experiences for a holistic cancer care."

Dr Zahra Azhar, Assistant Manager

22 Publications,
in high/medium impact journals

Grants Acquired: 1 ($ 120,000)
Awaiting: 6

THREE THEMATIC AREAS

Epidemiological research of cancer

- Conducting a prospective study, improving the quality of data and sample collection, and analysis pertaining to genetic and molecular mapping of the Pakistani population with brain tumors. Samples flying in from other cities such as Lahore, Peshawar, and Gambat will be stored at the small but standardized biorepository at COORS.
- Nurse navigators and follow-up mechanism are embedded into the study from the start to improve patient and caregiver experiences.

Basic Science

- Patient-derived brain tumor samples confronted with healthy brain tissue to understand the mechanisms by which the tumor invades healthy tissue, the molecular interactions and markers of our population, providing insights to why is it recurring.

Clinical Trials

- Drug repurposing trial for colorectal cancer in collaboration with AKU's Clinical Trials Unit, Department of Oncology and Department of Biological and Biomedical Sciences.
- University College London generated the initial evidence based on which they wanted to test the FDA-approved drug on South Asian populations and reached out to COORS for this.

Before any of the actual research can commence, months of groundwork and herculean effort goes into laying solid foundations that uphold principles of data confidentiality and ethics. From the infrastructure, SOPs and maintenance mechanisms for the biorepository to the nation-wide relationship building at participating institutions like Shaukat Khanum Memorial and Cancer Research Centre, Punjab Institute of Neurosciences, Lahore, Punjab; Khyber Teaching Hospital, Rehman Medical Center, Northwest School of Medicine, Peshawar, KPK; Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences, Gambat Khairpur, Sindh (GIMS), hard work and planning is put in place long before the first sample arrives. The study took more than a year of meticulous planning before materializing. For instance, creating and implementing new patient data record forms is a meticulous process that goes through layers of review; not only does that showcase attention to detail, but also the level of excellence that is demonstrated at every step at AKU.

CAPACITY BUILDING AND ADVOCACY

- Setting benchmarks by instituting systems and processes like unique patient identifiers and records that do not exist in other healthcare institutions in Pakistan
- Team of volunteers and students across Pakistan; training and learning by doing
- Cross learning, for instance, learning from the existing bio bank at Shaukat Khanum
- Workshops and conferences

NEXT STEPS

- Build upon existing work and studies, and explore new avenues of funding and sustainability
- Translating that research/evidence into tangible treatments and outcomes, which can be integrated into national policy
- Build partnerships with the federal and provincial governments, and agencies like DRAP

Precision Medicine: Due to the high cost of treatment and lengthy DRAP registration procedures, investment needs to be made in the right solutions for our population, backed by solid research.

The mission of COORS boils down to improving holistic patient care, by affecting accessibility and affordability, and understanding the underlying pathology of our population along with the problems patients face, and the psychological care needed for loved ones. Their work doesn't just solve a clinical dilemma, but hits at the heart of enhancing quality of life.

The Centers story is one of a paradigm shift by centering the conversation around the patient's experience, the impact on his household income and his family; using patient-reported outcomes to generate evidence that in turn is used to tailor our treatment and policy response.

Center for Bioinformatics and Computational Biology

Data collection. Analysis. Synthesis. Interpretation.

Date of Inception: **September 2021**	Director: **Dr Imran Nisar**	Number of People: **10**

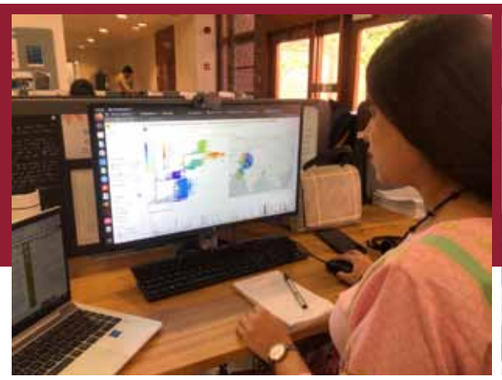
The roots of this Center can be traced back to the Department of Paediatrics and Child Health's work on biospecimens collected and stored in the AMANHI biorepository of 2500 pregnant women. At the time AKU did not have adequate resources for analysis of those samples, with specimens like stool and plasma going to wet labs in North America for advanced analysis. However there was a belief that if the right people could be recruited, in-house capacity could be built, at least for data analysis if not for wet lab. This in-house capacity to analyze and interpret our own data is critical to understanding the story that our biorepository holds through a systems biology approach.

"I really believe in the value of the data and specimens generated in the country remaining within the country. The intellectual property of the data generated in a country belongs with its people and should not be handed over to others. We only take on studies where the maximum benefit is to our own institution, nation and community. Equity is the major driver for me, and over time our funders are now showing greater confidence and coming to us for answers."

Dr Fyezah Jehan, Chair, Dept. of Child Health

Finding the right resource at the right time is key; and this is where Assistant Professor, Dr Waqasuddin Khan came in. He had just returned from a post-doc in France in genomics and had the right bio-chemistry background for the role.

It was a leap of faith, one that the funding agency took with the team in allowing them to do the dry lab analytics at AKU. The journey towards bioinformatics began in earnest and it has been full steam ahead since. Once the agencies saw promising dry lab outcomes, the Center got funded for sequencing in wet lab as well and this is where the real impact lay. The ability to conduct this research coupled with the need for countries to develop their own capacities for health emergencies post the covid pandemic, resulted in the first funded project for sequencing with the procurement of the department's first sequencer. After a year of meticulous online training and close monitoring by the funder, capacity was built in-house and the first SARs Cov2 sequencing was done. As a result, the team also contributed to the global covid spectrum database, and it is at this point that Dean Haider recommended that a designated Center for Bioinformatics be formed due to the cross-cutting nature of this work across pathogen genomics, multi-omics, discovery, contribution to science and policy.



It is no surprise that when data is generated locally in the population that is facing that specific health issue, with proper consent and transparency, the credibility and impact is greater. The learnings that are extracted from the biorepository are applied to future research with future interventions driven by those outcomes. For instance, the team found that a certain microbe when present in a pregnant women's gut results in greater chances of a full-term pregnancy, so all future interventions will be geared towards enhancing that outcome.

Prevotella, an organism that lives in the gut, is considered bad in the West due to its association with inflammation that drives negative outcomes. But in our unique experience the team found that its presence results in good pregnancy outcomes for local women. Based on diet and environmental factors, the same bacteria may act as a good bacterium for one population group but in the absence of certain staple foods in another population, it could perform differently.

"Bioinformatics is like distinguishing between fingerprints. Just as every human has a unique fingerprint, each bacterium and virus has a unique DNA, and bioinformatics assists in establishing that distinct identity at the nucleic acid level that cannot be completely ascertained through microscopes."

Dr Imran Nisar, Director

The work the Center does ultimately helps in the prevention of disease by zooming in on where the potential disruption may be in the molecular makeup, cellular function, signals, proteins, enzymes or even environmental disruption. Current epidemiological models of studying disease are no longer enough; treatments need to be refined by understanding the biological and molecular mechanisms at play specially if we are to move the needle on issues like premature births, anemia etc.

Bioinformatics and genomics are crucial to this new paradigm with the Center for Bioinformatics and Computational Biology uniquely poised to take on this mantle due to the presence of in-house expertise but also the unique environment AKU operates in. There is no doubt that the existence of this Center and its work makes us better prepared to face any future health emergency or pandemic.

PARTNERSHIPS

World Health Organization (WHO)

UMass Chan Medical School

University of Cincinnati

Sapient

Synapse

University of California, San Francisco (UCSF)

The University of North Carolina at Chapel Hill

Bill & Melinda Gates Foundation

Stanford University

Johns Hopkins Bloomberg School of Public Health

THSTI (Translational Health Science and Technology Institute)

Chan Zuckerberg Biohub

Wellcome Sanger Institute

Public Health Alliance for Genomic Epidemiology

The University of Iowa

CPHK (Center for Public Health Kinetics)

National Institutes of Health (NIH)

Experimental Medicine Platform (EMP)

GAPPS (Global Alliance to Prevent Prematurity and Stillbirth)

icddr,b

Multi-omics of Mothers and Infants (MOMI) Consortium

Max-Plank's Institute, Germany

NEXT STEPS

- Expand on wet lab capacity

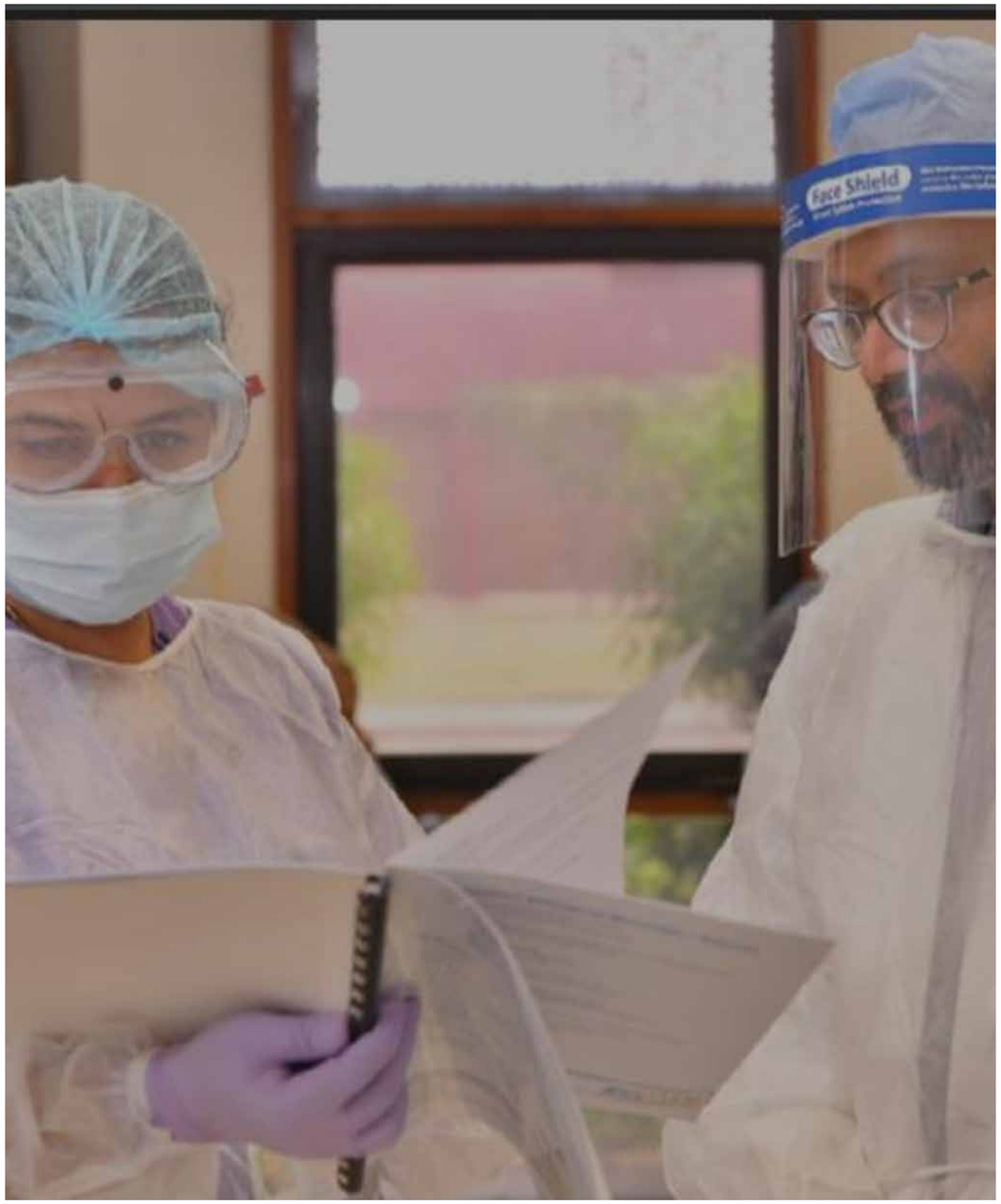
- Engage in more cross-country microbiome analysis with other countries sending their samples to AKU

- Explore diverse funding opportunities

- In the long-term, focus on the unexplored area of precision medicine and eventually develop a policy arm to bridge the gap between research and implementation.

14 Publications, in high/medium impact journals

Grants Acquired: 14 ($7,036,489 and Rs. 1.9M)



Center for Ageing Gracefully

Taking care of our elderly at home with the best quality of life possible.

Date of Inception: **April 2024**	Director: **Dr Rozina Karmaliani**	Number of People: **5**

The Center began as an idea at SONAM in the geriatrics stream to think about how the School could support the kind of training required to take care of the elderly at home. The conversation evolved into looking at aging as a whole and tackling the issues that Pakistan is and will face in the future as its population ages. A group of philanthropists showed interest in developing this idea further, and over the next year a partnership and implementation science approach was developed by leaders such as Dr Rozina Karmaliani and Dr Rubina Barolia.

It had to be done together – the Center started to bring in partners like AKUH, AKHSP, MC especially the Family Medicine department, the Ismaili councils with BMI coming into the fold at a later stage due to their expertise in health brain aging. The ambit started to expand from a service delivery model to capacity building, partnerships, financial sustainability, and scalability and over time SONAM and AKHSP conceptualized what the vision, agenda and ecosystem of the Center would be. It is the first nurse-led Center placed in a health sciences entity, CITRIC, with a multi-disciplinary approach to aging gracefully.

"Our eventual goal is to contribute models of care that allow the elderly to have improved quality of life at home. But equally critical is preparing leaders for a community approach to health, and bringing focus back to community health sciences, with an emphasis on the elderly population. Shifting the focus from frailty and morbidity to wellness, considering populations on their way to aging (45-59 years of age) rather than only getting to them once they have reached a certain age threshold," explained **Falak Madhani, Implementation Scientist**

The first step was an extensive literature review to understand global models and adapt them to local needs for best expected outcomes. The WHO Integrated Care for Older People Model has been adopted by the Center as the guiding principle with processes being put in place to monitor its efficacy in our local environment. The lack of holistic data on the population prompted the need for an expansive household survey in Karachi and the North of Pakistan. It is on-going exercise with data collection to be completed by July 2025, after which the process will move from baseline research and feasibility to implementation research and learning health systems.

Currently, there are 7 sites in Karachi, including the health facility and the surrounding community, where this model is being tested with follow up mechanisms and tools embedded in the study. For example, a simple outcome to look at is if someone has been identified with an issue, have they been connected to the right care?

"What sets the Center apart is its integrative approach: it actively engages healthcare professionals, researchers, educators, and community partners to co-develop an ecosystem of care that is person-centered, evidence-based, and contextually grounded. Anchored in an implementation science approach, the Center translates knowledge into practice to address real-world challenges. Designed to foster cross-institutional collaboration and alignment with the broader AKDN, the Centre stands as a model for interdisciplinary innovation and shared impact."

Dr Rozina Karmaliani, Director

FOCUS AREA

- Capacity building for those giving care at the home level
- SONAM's blended learning courses for training
- Developing content for the peer-led programme which has the ability to expand into other areas

THE CHALLENGE?

- Building systems that do not overburden the healthcare practitioner
- Aligning agendas as there will always be tension between research and practice. This is where building partnerships and relationships is crucial to ensuring that when we reach the target audience, we do so with solutions and offerings that are based in evidence, quality and demonstratable value.

FUTURE PLANS

The Center's trajectory is moving beyond the AKU ecosystem to create models that can be adopted within any community setting.

- Thinking about how to build researchers in this area – possibly having a focus on ageing in the Master's programmes.
- Working on building pathways with the government and bringing on partners who already run government facilities
- Engage with the government on financial planning for the elderly population
- Fund-raising for sustainability
- Cross collaboration with other Centers, joint applications and capacity building
- Grow the ambit to include things like elderly abuse, cultural constructs and social well-being

The Center for Ageing Gracefully is about primary care, prevention and promotion, for a demographic that has not received the care and resources it deserves. As for priorities, the disease burden and data will guide which areas take precedence but at the root the team believes in working with the person, not the disease.

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THE AGA KHAN UNIVERSITY

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