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The Role of Nuclear Medicine Capabilities in Fostering Convergence between Iran and the Persian Gulf States

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Extended Abstract

The foreign policy of every state is shaped by a complex interplay of geopolitical determinants, strategic interests, and relative advantages within both regional and international systems. The Islamic Republic of Iran, owing to its unique geopolitical position, has experienced a new phase of regional interaction since the 1979 revolution. A pivotal yet often strained aspect of this engagement has been its relationship with the member states of the Gulf Cooperation Council (GCC). Despite deep-seated historical, cultural, and geographical commonalities, relations between Iran and these Arab states over the past four decades have been characterized by a notable lack of strategic depth and stability. This instability is largely attributed to divergent security perceptions, interventions by extra-regional actors, and a chronic deficiency in tech-

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nical and non-political cooperation frameworks.

Concurrently, the GCC countries, despite significant investment in healthcare infrastructure, grapple with pressing health challenges, particularly a rising burden of non-communicable diseases (NCDs). These challenges are compounded by a scarcity of specialized medical personnel and a heavy reliance on expensive and often inaccessible treatment services from outside the region. In this context, leveraging Iran's proven comparative advantages in modern technologies, specifically within the field of nuclear medicine, presents a novel opportunity for functional cooperation and the strengthening of regional ties. Nuclear medicine, which relies on the production and clinical application of radiopharmaceuticals, is a critical tool for the early diagnosis and effective treatment of debilitating diseases, most notably various forms of cancer. According to the World Health Organization, the most prevalent cancers in the Gulf region—including breast, lung, colorectal, and liver cancer—require sophisticated diagnostic and therapeutic interventions. Iran, building on its substantial research and technological infrastructure, holds a prominent position in the Middle East and North Africa region and ranks 17th globally in the fields of medicine and pharmaceuticals. This standing, combined with its indigenous production capabilities and expertise in radiopharmaceuticals, creates an unparalleled opportunity for technological collaboration with its neighbors. Given the global supply constraints for certain radiopharmaceuticals, their short half-lives necessitating immediate use, and significant cost implications, the development of nuclear medicine tourism emerges as a practical solution for patients with specific ailments.

The central research question of this study is: How can nuclear medicine, as a technological and therapeutic capability, serve as a catalyst for convergence between Iran and the GCC member states? To address this question, the present study utilizes David Mitrany's theory of functionalism as its analytical framework. It examines three key variables: the shared need for advanced healthcare (the independent variable), Iran's nuclear medicine capabilities (the intervening variable), and the consequent strengthening of regional cooperation and convergence (the dependent variable). The primary objective of this research is to elucidate the role of Iran's nuclear medicine capacities in promoting region-

al collaboration, focusing on technical, therapeutic, and infrastructural indicators. This core objective is supported by secondary goals: identifying healthcare needs of GCC states regarding NCDs; investigating Iran's prowess in producing and transferring nuclear medicine technologies; analyzing the feasibility of scientific cooperation and medical tourism based on the functionalist model; and evaluating the long-term impact of such collaborations on deepening political and economic relations.

Methodologically, the research employs a qualitative content analysis approach. Data were sourced from a rigorous examination of scientific documents, international reports, specialized nuclear medicine data, and semi-structured interviews with Iranian officials and experts in this domain. The collected data were meticulously analyzed through the lens of Mitrany's functionalist theory to explicate the relationship between shared needs, technological performance, and the potential for cooperation to expand to broader regional levels.

A systematic review of existing literature reveals a significant gap. Prior research on Iran-GCC relations has predominantly concentrated on security dimensions, geopolitical rivalries, and energy matters, largely neglecting the potential of non-political technical-functional partnerships. The review identifies two distinct and disconnected bodies of work: one focused on the technical and medical aspects of nuclear medicine, examining Iran's capabilities and the region's needs in isolation; and another centered on political-security analyses, often making cooperation contingent on resolving security dilemmas and overlooking the central role of non-political technologies. No comprehensive study has employed Mitrany's functionalist framework to specifically analyze how peaceful nuclear cooperation, particularly in medicine, could bridge the gap between these technical and political spheres.

The theoretical underpinning is Mitrany's classic functionalist theory (1943). In A Working Peace System, Mitrany posits that technical cooperation in apolitical fields—such as health—can, by fostering a "habit of cooperation," build trust and gradually create a "spill-over" effect, paving the way for collaboration in more sensitive political matters. Iran's advancements in nuclear medicine are substantial and internationally recognized. With 155 nuclear medicine centers and 200 gamma cameras, it ranks second in the region after Turkey in infra-

structure. Iran is also one of the region's leading producers of radiopharmaceuticals, manufacturing 60 radiopharmaceuticals with 20 more in clinical trials. This progress, achieved despite significant international sanctions, underscores the nation's technological resilience. Advantages include specialized personnel trained over six decades, advanced imaging technologies like PET and SPECT, and cost-effective production of diagnostic and therapeutic radioisotopes, directly improving patient outcomes through early detection, diagnostic precision, and effective treatment.

Conversely, despite ambitious national programs for nuclear power, GCC states face significant lag in human resources and infrastructure necessary for advanced nuclear medicine. Data from the International Agency for Research on Cancer reveals a growing cancer burden, with Saudi Arabia accounting for nearly 75% of approximately 254,000 cases recorded in the Arab Gulf states over the past two decades. This escalating health crisis, characterized by high costs and reliance on foreign healthcare, creates a pressing common need—a cornerstone of Mitrany's theory.

Applying the functionalist framework, this study identifies several convergent components. First is the common need: the universal imperative to ensure public health and combat the shared threat of NCDs. Second is functional performance: the practical, problem-solving approach of addressing health needs through specific, non-political mechanisms like medical treatment and technology transfer. Third is the spill-over effect: the probability that successful technical cooperation will create precedents and institutional linkages, which can extend to other areas of economic and scientific interaction. Fourth is technical self-determination: the principle that functional organizations can be structured flexibly to meet immediate needs without imposing overarching political systems. Finally, voluntary cooperation is central: all states can participate based on self-perceived benefit, as all stand to gain from improved public health without compromising sovereignty.

In conclusion, this research demonstrates that Iran's nuclear medicine capabilities represent not merely a technical asset but a potent and untapped strategic instrument for fostering regional convergence. By framing this collaboration through a functionalist lens, the study provides a novel model for scientific

diplomacy. It argues that by focusing on shared health imperatives, Iran and its Arab neighbors can bypass deep-seated political rivalries to build trust and interdependence. The findings strongly suggest that medical nuclear cooperation is a feasible, cost-effective, and politically viable mechanism to improve health indicators and lay the groundwork for deeper and more stable political and economic relationships in the Persian Gulf region. This approach fills a critical void between technical and security-focused studies and offers a pragmatic pathway to transform a point of contention into a platform for shared prosperity and peace.

Key words: Nuclear Medicine, Radiopharmaceuticals, Convergence, Mitrany's Functionalism, Iran, Persian Gulf States

Conflict of Interest

The authors declare that there is no conflict of interest in conducting this research study.