FROM SURGICAL WARD TO THE COMMUNITY: A TRANSLATIONAL RESEARCH MODEL FOR CYSTIC ECHINOCOCCOSIS INSPIRED BY THE ALMATY DECLARATION ON PRIMARY HEALTH CARE (1978)

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Abstract

Cystic echinococcosis is a neglected zoonotic disease with a heavy burden on surgical wards in endemic countries such. Despite advances in diagnostics and treatment, a gap persists between research findings and their translation into patient care and community-level control. In this mini-review, Cystic echinococcosis is discussed as a model for translational research within the framework of Primary Health Care tracing the path from bench to bedside and back. The Iranian experience, led by the Research Center for Hydatid Disease, demonstrates how surgical and clinical observations can drive innovations in registries, diagnostics, community education, and policy initiatives such as humane dog population management. This cycle of evidence generation, implementation, and feedback represents the essence of translational research, bringing science and services closer to people, as envisioned by the Almaty Declaration on Primary Health Care in 1978.

Introduction

In many endemic countries, surgical wards carry a heavy burden of patients affected by cystic echinococcosis (CE), a complex parasitic infection, caused by the larval stage of *Echinococcus granulosus.*[1,2] Surgeons are frequently confronted with challenging liver or lung cysts at advanced stages, requiring technically demanding operations and prolonged hospital care.[2] Delayed diagnosis, frequent mismanagement, and recurrence further complicate surgical outcomes, making CE not only a clinical challenge but also a major public health and economic concern.[3,4]

The disease persists in communities where dogs act as definitive hosts and livestock serve as intermediate hosts, with humans as accidental hosts. In Iran and across the Middle East and Central Asia, CE remains endemic, and despite advances in medical therapy and prevention, it continues to account for significant surgical morbidity and health system costs.[3,5,6]While surgery remains the cornerstone of treatment in many cases, CE is not merely a surgical disease. It is a public health challenge at the human–animal–environment interface.[2,7]

The Almaty Declaration of 1978, adopted in Kazakhstan, introduced Primary Health Care (PHC) as the foundation for health systems, emphasizing prevention, equity, community engagement, and intersectoral collaboration.[8] Forty years later, the Astana Declaration in Kazakhstan renewed this global commitment to PHC as the pathway to universal health coverage and the Sustainable Development Goals (SDGs).[9] The principles of PHC are deeply relevant to CE: the disease's persistence is linked to gaps in early detection, community awareness, preventive veterinary services, and health system coordination.[10,11]

In this review, CE is presented as a model for translational research, where discoveries from the laboratory (the "bench") are brought to the clinic and community (the "bedside"), and where patient and community realities drive new research questions (the reverse pathway).[12,13] Drawing on the Iranian experience, particularly the work of the Research Center for Hydatid Disease in Iran (RCHD), we examine how CE research has informed surgical practice, community outreach, and policy, and how these in turn have shaped further research directions.

Materials and methods

Study Design and Search strategy. Given the narrative nature of the review, a broad literature search was performed in PubMed/MEDLINE, Scopus, Web of Science, Embase, and Google Scholar using combinations of relevant keywords and MeSH terms "Primary Health Care", "Cystic echinococcosis", "Hydatid Disease", "Community and Policy Translation", " Almaty Declaration" in various combinations. We also manually searched reference lists of retrieved articles to identify additional relevant studies.

Results

Translational Research: Bench to Bedside

The concept of translational research seeks to bridge the persistent gap between scientific discovery and practical benefit for patients.[12]A major achievement in Iran has been the establishment of the Iranian Hydatid Disease Registry (HydatidReg) in 2014, later upgraded to a national registry in 2016 and integrated into the European Register of CE (ERCE).[14,15] HydatidReg standardizes the collection of clinical and surgical data, including cyst characteristics, treatment outcomes, and epidemiological details. It also incorporates a biobank with patient sera, cyst material, and parasite DNA, providing a foundation for translational studies on diagnostics, immunology, and genetics. The registry has improved data quality, facilitated clinical audits, and generated evidence to guide national CE management guidelines.[10,14]

Another significant translational achievement is the expansion of community-based ultrasound screening programs. By taking diagnostic capacity into rural and underserved settings, these initiatives have enabled earlier detection of asymptomatic CE, reducing the burden of advanced surgical cases.[10,16] Portable ultrasound has proven not only a diagnostic tool but also an opportunity for community education, as health workers explain transmission dynamics and prevention during the screening process.[17]

The WHO-IWGE classification of hydatid cysts provides a standardized, evidence-based framework for diagnosis and clinical management, enabling surgeons and radiologists to make consistent treatment decisions and to improve comparability of outcomes across centers.[6]Translational research has also informed professional training. Posters illustrating the WHO-IWGE classification of cysts, [18] have been distributed to radiologists and surgeons nationwide, while continuing medical education workshops and virtual courses have strengthened diagnostic and surgical skills (Figure 1). These efforts exemplify how laboratory-derived classification systems, once validated, can be translated into bedside practice, improving surgical decision-making and reducing inappropriate interventions.[10]

Figure 1. Community ultrasound screening: Opportunity for People education

Finally, access to chemotherapy has been enhanced through the albendazole donation program, supported by WHO via Glaxo Smith Kline donations, which provides millions of tablets annually for CE patients.[19] While surgery remains the primary treatment, albendazole plays a vital role in pre- and post-operative management and in selected non-surgical cases.[5,6] Its wider availability has not only improved patient outcomes but also created opportunities for public education on adherence and long-term care. Albendazole donation program to the CE patients provides an opportunity for patient education and community outreach.

Together, these initiatives illustrate how research outputs (registries, diagnostic protocols, training programs, and pharmacological access) have been translated into tangible benefits for patients in Iran's surgical and medical settings.

Bedside to Bench: Clinical Observations Driving Research

Experiences in the surgical ward and community settings generate crucial insights that must return to the laboratory for further exploration, therefore translational research is not a one-way street.[12,13]Studies on treatment seeking pathway in CE patients in Iran have documented an average delay of 1.5 months to diagnosis and 3.2 months to surgery, with patients typically consulting multiple physicians before referral.[10] These findings underscore systemic gaps: inadequate imaging access, poor physician awareness, and fragmented referral systems. Such clinical realities have shaped research priorities, emphasizing the development of new diagnostic algorithms, training interventions, and health system reforms.[7,14]

Recent qualitative research with CE patients has revealed mistrust of physicians, fear of surgery, and financial constraints as barriers to timely care.[10] These patient perspectives highlight the need for non-invasive therapeutic alternatives, improved pharmacological options, and research on the socio-economic determinants of CE care.[11]It also signifies the importance of integrating patient education and counseling into surgical practice, aligning with PHC principles of people-centered care.[8,18,20]Regional disparities in diagnostic delay further emphasize inequities within the health system. Patients from underdeveloped provinces face longer diagnostic journeys, pointing to the need for health services research on equity, access, and decentralization.[10,21]

Clinical diagnosis of pulmonary CE, sometimes confused with other respiratory diseases, illustrates another bed-

side-to-bench pathway. Misdiagnoses highlight the need for biomarkers and point-of-care diagnostics, stimulating laboratory research into novel molecular / serological tools that can support earlier and more accurate detection.[22,23]Thus, the realities of the surgical ward and the lived experiences of patients can directly shap research agendas in endemic countries, ensuring that future discoveries remain aligned with real-world needs.

Community and Policy Translation: Closing the Loop

Beyond the clinic, translational research in CE extends to community and policy domains. The Almaty Declaration emphasized that health is created not only in hospitals but also at homes, schools, workplaces, and communities.[8] The Iranian experience demonstrates how translational research on CE can be embedded within this broader PHC framework. The role of public education campaigns iscentral. RCHD has developed pamphlets, storybooks, and motion graphics to raise awareness about CE transmission and prevention.[14,18] A particularly innovative approach has involved asking children who have undergone surgery for CE to draw pictures of what they believe caused their illness. These drawings frequently depict dogs, sheep, and contaminated environments, reflecting children's intuitive grasp of transmission routes (Figure 2). Such educational activities serve as powerful tools for family and community engagement, turning individual surgical experiences into broader preventive messages.

Figure 2.
Expanding access to CE diagnostics – Ultrasonography is the diagnostic of choice to detect CE in people

At the policy level, RCHD has contributed to dog population management strategies. By translating international guidelines on humane dog population management into Farsi [24] and conducting the first systematic survey of free-roaming dog populations in Iran,[25] RCHD has provided evidence to inform national policy. Infographics and policy briefs (Figure 2) have been shared with health and veterinary authorities, aligning CE control with broader One Health initiatives.[18]

PHC provides the platform for these translational efforts. Community health workers and family physicians are often the first point of contact for CE patients. Strengthening their capacity to diagnose CE, apply ultrasound protocols, and deliver preventive education ensures that translational research reaches the grassroots level. Embedding CE diagnostics, referral pathways, and educational tools within PHC not only reduces surgical burden but also advances the Almaty vision of equitable, community-based healthcare.

Discussion

The Iranian experience demonstrates how CE, though often seen primarily as a surgical problem, can serve as a powerful model for translational research in neglected zoonoses. The cycle from bench to bedside and back is evident: laboratory and epidemiological research generate clinical tools and registries; clinical observations highlight systemic gaps and patient barriers; community engagement and policy advocacy close the loop, feeding back into

new research directions.[12,26]

Framing CE within the history of PHC adds depth to this model. The Almaty Declaration (1978) asserted that health is a human right and that progress depends on bringing science and services closer to people through prevention, early diagnosis, equity, and community engagement.[8] The Astana Declaration (2018) reaffirmed PHC as the pathway to universal health coverage and the SDGs.[9,26] CE research in Iran illustrates these principles in action: registries enhance early diagnosis; community ultrasound empowers PHC; children's drawings bring prevention into families; humane dog management links human and animal health.

This perspective emphasizes that echinococcosis and hydatid disease cannot be confined to the operating theater. While surgery remains vital, the surgical ward is only one node in a broader cycle of knowledge translation. Surgeons are not only operators of cyst removal but also active participants in a research–policy–patient loop, where their observations guide research, their outcomes shape guidelines, and their patients' experiences inform community education.[26,27] Recognizing this role strengthens the impact of surgical practice and aligns it with global health priorities.

Conclusion

Research on cystic echinococcosis can illustrate the essence of translational research: a cycle of evidence and experience that moves from the laboratory to the surgical ward, into communities, and back again. The establishment of CE registry, the expansion of community ultrasound, the integration of albendazole therapy, professional training, and public education campaigns all demonstrate how research can be operationalized in clinical and community settings. At the same time, the delays, barriers, and inequities faced by patients have shaped new research questions, ensuring that future discoveries remain relevant.

Placed in the historical context of the Almaty Declaration and the continuing vision of PHC, CE research in Iran shows how translational science fulfills the mandate of bringing health closer to people. For surgical practice, this means moving beyond the operating theater to engage with communities, and policies. For health systems, it means recognizing that neglected zoonoses like CE demand not only technical interventions but also people-centered, equitable, and preventive strategies. The spirit of Almaty, that science must serve people, remains alive in this translational journey from bench to bedside and back.

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