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EDITORIAL

From the ‘what, so what, now what’ to the ‘what works, for who and why?’

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It is an honour and a pleasure to be asked to write an editorial for the Radiography Open Journal for the tenth volume. Since 2014, the journal has published a diverse range of research from across the globe, ranging from literature reviews of radiography research in Norway[1], qualitative interviews on the future of radiology in Sweden[2], Magnetic Resonance Imaging (MRI) in Denmark[3], neonatal chest X-ray techniques in Nepal[4], image cropping in Iceland[5], the evolution of medical imaging in Guyana[6] and Radiological Information Systems (RIS) and Picture Archiving and Communication Systems (PACS) in Greece[7]. Cross-contamination of lead aprons in Switzerland[8], digital subtraction angiography (DSA) in India[9], diagnosis of pulmonary embolism in Peru[10], case studies from Ecuador[11] and Japan[12], students ability and confidence in interpretation of chest X-rays in England[13], students perspectives of introducing doctoral training in Ghana[14], and Computed Tomography (CT) protocol auditing in Togo[15]. Encompassing a truly global collective of radiography researchers and many examples of collaborations of radiography research across borders[16,17].

Radiography training and education supported by professional body guidance[18] within the discipline of research often starts with an academic approach to understanding the different philosophical approaches (positivism to interpretivism) before moving to develop theory (deduction to induction) which aligns with methodological choices (quantitative, qualitative, mixed methods data collection), the strategies of research design (empirical research, surveys, focus group interviews, case studies, literature reviews, etc.), approaches (action research, grounded theory, narrative inquiry, ethnography, etc.), time horizons (cross-

sectional, longitudinal, etc.), and the techniques and procedures of the data collection and subsequent analysis, often expressed in the six layers of the research onion[19]. Within the last ten years, the journal has helped to publish a vast anthology of radiography research, many of which students have authored and should be celebrated.

This critical mass of research is key to creating the evidence basis from which clinical practice will evolve and develop, bridged by the links between academia and clinical environments. Evidence-based practice (EBP) within radiography, as with most healthcare disciplines[20], is a key concept to ensure that clinical decisions and practice are informed by research to provide the best available patient care, focused on improving patient outcomes, using the best quality of service delivery and cost-effectiveness grounded in a research background, and highlighted in the very first volume of the journal[1].

In radiography, the idea of an EBP has been used to advance research from an educational standpoint[18] as well as radiographers' perceptions regarding its application in training and involvement in research activities[21]. However, studies have identified the inconsistent implementation of EBP[22] for a range of reasons that impede knowledge translation[23] ranging from problems of engaging all stakeholders of both healthcare professionals and patient opinions[24] and assessing and addressing behavioural factors[25] in radiology staff that impede organisational change to adopt EBP[26].

Beyond conducting literature reviews, formulating clinical practice questions using PICO [27] (Patient, Intervention, Comparison, Outcome) frameworks, such as which imaging technique is more effective (diagnostic efficacy[28], clinical utility, value[29], cost[30], the risk versus benefit, etc.) to identify and critically appraise the quality, transparency and rigour of the research to be used as evidence to underpin the theoretical knowledge to base clinical practice change upon.

Or conducting empirical research to identify the '*what, so what, now what'* approach encompassing the *'what'* of the topic under investigation, the *'so what'* of the findings and results, and the *'now what'* of the discussion framing the findings into the clinical practice environment, and its alignment to national radiography and healthcare professional policy and guidance. It is important to consider researching how evidence is integrated into clinical practice.

A whole research methodology, called implementation science, is dedicated to exploring how healthcare services and providers adopt evidence into clinical practice. However, the key problem it focuses on is the delays associated with translating new research knowledge into clinical practice. Some sources quote an average of 17-20 years before evidence is adopted fully into routine practice, with less than 50% ever achieving this[31]. Thus, there is a growing need for implementation research, often defined as the study of methods to promote the systematic adoption of research findings (evidence) into routine EBP in healthcare settings[32].

To make research effective and to support its adoption into EBP, there is a need for follow-on research to concentrate on investigating the '*what works, for who, and why*' in clinical practice using a realist evaluation methodology[33] when attempting to implement evidence-based change and to sustain the long-term patient outcomes and service delivery benefits. The key to the '*what*' is researching the local context[34,35], specifically, the local variables that challenge introducing evidence-based findings into routine clinical practice change. Such as clinical workplace culture and receptiveness to change, the patient experience and local audit data. The local context is often key to understanding the behavioural factors that influence the adoption of evidence-based interventions. Its complexity ranges from organisational level barriers, hierarchical leadership styles, peer pressure, cultural norms, and professional values to resource availability. Evaluation of '*what works*' when implementing change will be multifaceted and different (with often significant heterogeneity) in each clinical department. Thus, the local context is key. This will then enable identification of what individuals, staff groups, or stakeholders embrace change and what resist it, the '*for who*'. But most importantly, recognition of the '*why*' loops back to the clinical workplace context, culture, habits, routines, values and beliefs of '*how things are done around here'*[36] to identify what is needed to make change effective and sustainable long-term in real-world scenarios, and this might range from leadership, behavioural norms to resource allocation and training.

The research discipline of Implementation Science has been specifically developed to explore the next steps in follow-on research on how to successfully implement evidence-based findings and facilitate change in individuals and collectively as a healthcare service. The Promoting Action on Research Implementation in Health Services (PARIHS)[37,38] framework provides core constructs to guide researchers to implement EBP through change using the interplay of evidence, context and facilitation. Which is similar to the Consolidated Framework For Implementation Research (CFIR)[39] Once the evidence based on the initial published research has been identified, implementation facilitation research should be conducted to assess the workplace context and culture and its receptiveness to change. This can be through observational data collection; there are many tools available, such as the Context Assessment Index (CAI)[40] applying quantitative ranking (ordinal data) of the workplace environment, or the example of the Workplace Culture Critical Analysis Tool (WCCAT)[41] for qualitative feedback mechanisms. Once the context has been researched, the findings will feed into the situational facilitation[42–44] of implementing change at a local contextual level[45–47] However, other theories, models, and frameworks can be adopted for research into addressing the influences upon radiographers' behaviour in the clinical workplace of resistance to change and adoption of EBP. Away from the local context exploration, research into identifying the factors (barriers and facilitators) that influence specific behavioural determinants to prioritise and target for change could adopt the Theoretical Domains Framework (TDF)[47], which can also be applied to determine cognitive, affective, social, or environmental influences that inhibit change adoption.

In summary, the education and training of radiographers to engage in research will benefit the EBP of radiography globally, improve patient outcomes, enhance patient-centred care, and support decisions to adopt the latest research findings that underpin effective and efficient radiological service provision. However, for the successful long-term sustainability of EBP, follow-on research will always be required to bridge the gap of translating knowledge into practice and how to successfully implement research findings into the workplace to close the loop and reap the full benefits of research activities. Follow-on research will require engaging patients, staff groups, and stakeholders to foster buy-in and support for the adoption of EBP. But as a profession, radiography must start to embrace a follow-on research approach to identify workplace resistance to change, explore the local contextual factors specific to the culture, leadership and organisation, to determine the factors and influences of behavioural change and tailor interventions for implementation to individuals, contexts and barriers to facilitate change and adoption of research findings.

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