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Narrative Review

The value of case reports in diagnostic radiography

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ABSTRACT

Objective: – This paper sought to explore the value of case reports in diagnostic radiography with regards to current usage, relevance to evidence-based radiography, and educational benefits.

Key findings: Case reports are short accounts of novel pathologies, trauma or treatment with a critical review of relevant literature. Examples within diagnostic radiography include the appearances of COVID-19 alongside examination-level scenarios involving image artefacts, equipment failure and patient incidents in radiology. With greatest risk of bias and lowest generalisability, they are considered as low-quality evidence with generally poor citation rates. Despite this, there are examples of significant discoveries or developments initiated with case reports with important patient care implications. Furthermore, they offer educational development for both reader and author alike. Whereas the former learns about an unusual clinical scenario, the latter develops scholarly writing skills, reflective practice and may generate further, more complex, research. Radiography-specific case reports could capture the diverse imaging skills and technological expertise currently under-represented in traditional case reports. Potential avenues for cases are broad and may include any imaging modality where patient care or safety of other persons may illicit a teaching point. This encapsulates all stages of the imaging process, before, during and after patient interaction.

Conclusion: Despite being low-quality evidence, case reports contribute to evidence-based radiography, add to the knowledge base, and foster a research culture. However, this is contingent upon rigorous peer-review and adherence to ethical treatment of patient data.

Implications for practice: With the drive to increase research engagement and output at all levels in radiography (student to consultant), case reports may act as a realistic grass–root activity for a burdened workforce with limited time and resources.

Introduction

This review considers the publication of case reports in radiography journals and their value within diagnostic radiography. Case reports are descriptive studies typically presenting a detailed account of an individual patient including aspects such as signs, symptoms, diagnosis, intervention and outcome.[1,2] In terms of the hierarchy of evidence, they are regarded as one of the lowest forms with the greatest probability for bias and lack generalisability in clinical practice.[3] Case reports are infrequently cited and may therefore reduce the impact factor of a journal,[4] leading to some journals removing case reports as accepted formats altogether. Despite these negative connotations, they provide a platform for new or unusual pathologies, medical techniques and other novel findings. The effects of thalidomide[5] and the zika virus[6] upon unborn children were both initially published within case reports, as was the first heart transplant[7] and isolation of the human immunodeficiency virus.[8] Case reports have often been discussed as beneficial to evidence-based practice,[9–13] with specific educational benefits for junior staff.[14,15] Lastly, they offer a relatively quick publication route, higher acceptance rates with a growing range of dedicated journals across many specialisms.[16]

The College of Radiographers Research Strategy (2021–26)[17] advocates the distribution of research to the relevant forum and encourages research at all levels (student to consultant). However, authoring radiographers have been shown to be predominantly within their mid-to-late career and typically affiliated with a higher education institution.[18] Grassroot-level engagement in clinical audits and presentations at conference are both within the strategy, but case reports are not explicitly mentioned as a means to increase research output. As an entry-level form of research, case reports offer a realistic option for an increasingly stretched workforce. With

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an absence of a research culture being identified as one barrier in clinical practice,[19] perhaps case reports may encourage early career radiographers and thus foster further, more complex research. This article explores the publication of case reports within radiography journals, their role in evidence-based radiography and the educational potential for staff. Lastly, this review explores the notion that diagnostic radiography case reports may be distinct from those found in medical literature due to the nature of examination-level teaching points for radiography practice.

Publication of case reports within radiography journals

A wide range of diagnostic radiography topics have been covered within case reports, spanning multiple imaging modalities, individual pathologies, examination-level experiences and equipment issues. Examples include the recent surge in COVID-19 studies[20–23] which provide short, yet informative, accounts of radiological appearances. Whilst educational for all healthcare professionals, one such study specifically addresses radiographer preliminary clinical evaluation.[21] Botwe and Obeng-Nkansah offer their personal experience of a patient suffering from a drop attack during chest radiography, highlighting an uncommon but important risk for consideration.[24] Other, more numerous, publications provide scenarios where equipment issues or image acquisition techniques have adversely affected patient outcomes. The appearances of ingested orthodontic brackets in the rectum of a patient during magnetic resonance imaging provide an interesting, if bizarre, example of image distortion due to metal artefact.[25] Nuclear Medicine and computed tomography (CT) have also provided image artefact case reports, due to incorrect collimator selection and patient positioning respectively.[26,27] Examples are not limited to diagnostic radiography, with a dosimetric case study for Hodgkin's disease from radiotherapy comparing parallel-opposed-pair with intensity-modulated radiation therapy techniques.[28] Finally, case reports have been used to highlight unusual pathological findings in archaeological remains using medical imaging,[29] although these are understandably rare.

Case reports are not currently accepted within *Radiography*, ending in 2021, with *Radiology Case Reports* suggested as an alternative. Other options include the *Journal of Medical Imaging and Radiation Sciences*, *Radiologic Technology* and *The South African Radiographer*. A search of all previously published case reports within *Radiography* generated 38 articles between 2013 and 2021, with a total of 97 citations and 788 'readers' on Mendeley according to Plum analytics (dated 21st November 2022) giving an average of 2.55 citations per article. To compare, the editorial articles during the same time period (n = 54) had 170 citations (average 3.15) and 834 readers. Given the reliance of citations as an indicator of journal prowess,[30] it is little wonder why *Radiography* chose to remove case reports. The irony is that editorials provide a higher average citation per article than case reports despite being considered a lower form of evidence as commentary or opinion. A contrasting view is created when comparing average readership between the two article types within *Radiography*; case reports exceed editorials when compared like for like (20.74 versus 15.44). However, this was not uniformly distributed across all case reports, as four articles constitute 43% of readers (n = 341) and were COVID-19 specific.[20–23] A direct comparison of case report citations versus reader statistics across radiography journals is beyond the scope of this review. Nevertheless, an equal number of case reports (n = 38) within the same timeframe (2013–2021) in *The South African Radiographer* demonstrated 6 citations, an average of 0.16 per article. With the drive towards higher impact research to elevate the standing of the profession,[31] it is evident that case reports occupy a low priority for encouragement.

Evidence-based radiography

Evidence-based radiography (EBR) is defined as 'radiography informed and based on the combination of clinical expertise and the best available research-based evidence, patient preferences and available resources'.[32] Examples of EBR within published literature exist, such as the reduction of daily chest radiographs at one intensive care unit in the United States of America following clinical and cost analysis.[33] The ability of case reports to inform practice within radiography is dependent upon their perceived value as evidence. Brettle provides a guide through the EBR process and explains the five stages involved: ask the question, acquire information, appraise the quality, apply into practice, and assess the outcome.[34] Of pertinence to this review is the appraisal stage, where the research is critically evaluated, and low-quality evidence is excluded when answering the clinical question. Although case reports are low within the hierarchy of evidence, an absence of alternative evidence gives justification for their use. Systematic reviews are regarded as higher quality evidence with lower risk of bias, but on occasion cite case reports within their findings. For instance, studies involving toxic mega colon appearances on CT[35] and three-dimensional printing for congenital heart disease[36] encountered sparse literature and relied upon case reports to answer their clinical questions. In keeping with the definitions of EBR, case reports may therefore be deemed as the best available research in a vacuum of alternatives.

In the development of protocols or guidelines, EBR is used for the standardisation of patient care in medical imaging.[37] To facilitate this is the requirement for examination-level evidence[38] to demonstrate effective, efficient, and safe practice. Within projectional radiography concerted efforts have been made to reassess basic techniques for knee,[39] lumbar spine,[40] and hand examinations.[41] Likewise, research into CT kidney-ureter-bladder imaging[42] and individualised techniques within mammography[43] have also been investigated. Somewhat telling is the absence of case report citations in the aforementioned studies and published radiography research in general, raising the question over their relevance for EBR. An obvious reason would be the sparsity of case reports directly related to the provision of imaging, although examples exist. Tusk details an instance of improper patient positioning during CT hip imaging for prosthesis assessment which demonstrated an apparent fracture through the metalwork.[26] The initial outcome was sufficiently suspicious to warrant repeat imaging with an adjustment to patient positioning which eliminated the artefact. Rather than focusing upon patient differential diagnosis or management, the article explores radiographic technique. A holistic approach to examination-level evidence could include any aspect of patient care during image acquisition or equipment preparation. Elliott and Weatherley present an occasion where a Nuclear Medicine practitioner incurred a radiopharmaceutical needlestick injury to the hand caused by equipment error.[44] The event occurred prior to patient interaction, but has important ramifications for radiography practice nonetheless.

The College of Radiographers Research Strategy encourages the 'dissemination of case studies where research activities have led to improvements in patient care and service delivery'.[17] Case reports would arguably fulfil this statement, albeit for incidental circumstances and reliant upon anecdotal evidence or data collection. The advantage of case reports as evidence belies their low standing in academia; case reports enable practitioners to capitalise upon unfortunate incidents or novel findings to inform practice. Indeed, many practice-learning scenarios may not be ethically possible to re-create under experimental conditions, especially with patient or staff endangerment. The capture of real-world data as opposed to simulated models affords a high level of fidelity which serves as a

golden opportunity for academic exploitation. The quality of which is dependent upon rigorous peer-review though, with some journals only utilising one reviewer for case reports. The role of the reviewer is to assess the validity of the science, significance of the research, identify significant errors and highlight typographical or grammatical errors.[45] Inappropriate reviewer selection, or limiting to one reviewer, may degrade the peer-review process and therefore the generation of evidence.

Educational benefits

Educational benefits may be viewed from the perspective of registered practitioners or those within formal education (undergraduate/postgraduate). The Health and Care Professions Council (HCPC) require radiographers to evaluate research and other evidence to inform their practice.[46] This is echoed within the Society of Radiographers Code of Professional Conduct, adding that practitioners must employ reflective practice with audit and research.[47] Unquestionably, case reports provide educational value with key learning points to the reader. It could also be argued that they provide personal development of the author(s) and an opportunity for reflective practice. With lower word count allowances (~1000) and clearly defined structures, they are considered easier and quicker than writing full research articles.[13] Furthermore, they are perceived as entry-level attempts for academic writing and gateways towards more advanced research.[15] Being able to create a short report in the format and standards of an academic journal requires diligence and attention to detail. Irrespective of whether an article is accepted for publication or not, authors benefit from the experience of a critical review of relevant literature and academic writing.[15]

The use of case studies or clinical scenarios as problem-based learning exercises has been suggested as one method of increasing student comprehension and clinical decision-making abilities.[48,49] Case report writing, as a vehicle to achieve this, has been used within undergraduate radiography pedagogy to develop academic skills. One study from Makerere University (Uganda) implemented a longitudinal observation of 25 radiography students with successive case report submissions as part of the assessment strategy.[50] Feedback was positive, with particular praise for the brevity of case reports as a format of assessment and the opportunity for students to self-select topics for investigation. Other pedagogic research can be found within undergraduate medicine, with instructors and students attesting to a variety of benefits. These include the development of observation and pattern recognition skills (to identify a suitable case), hypothesis generating skills, understanding of patient-centred care, writing skills and rhetorical versatility, and generating formal research in miniature.[51] Similar efforts have been made with postgraduate medical students, with participants submitting work before and after tailored workshops.[52] As with the previous examples, post-workshop feedback reported significant improvements in analytical skills and confidence in academic writing.

The challenges and limitations of using case reports as an educational tool must also be considered. Instructors raised concerns with ensuring patient confidentiality and an over-interpretation of the case without due consideration for the wider perspective.[51] In addition, feedback from medical and radiography students highlighted either a lack of formal training, mentors, or time within the academic workload to complete case reports during their studies.[50,53] These factors are subject to the variable availability of local resources, expertise, and pedagogical approach. Of certainty is the importance is maintaining patient confidentiality for ethical use of patient imaging and associated medical data. Guidance on the use of patient imaging for teaching, training and research is provided by the Royal College of Radiologists, based upon routine imaging.[54] Informed patient consent is required when identification is, or may be, possible. Conversely, if there are no means by which the patient can be identified consent is not necessary. To avoid uncertainty, and legal refute, many case report journals require informed consent for all submissions without exception. As a developmental exercise for academic writing, use of real-world medical data may detract from the students' learning experience. Aside from the burden of identifying a suitable case, the student would need to navigate information governance, image export, and the implied expectation of submitting for peer-review. In contrast, hypothetical patient scenarios using medical imaging within the public domain would lower student stress and provide a simpler marking strategy for the assessor.

Radiography-specific case reports

The case report format originated within medicine but has since been adopted within journals catering for other healthcare professions with variations in terms or inclusion criteria. The overall aim is identical: to share teaching points in a succinct article. An examination of the typology or variations of case reports across healthcare professions is beyond this paper, however an argument may be made for radiography-specific case reports as a distinct topic based upon examination-level experience. As specialists in medical imaging, diagnostic radiographers possess a diverse technical skillset with direct (i.e. during imaging) and indirect (e.g. reporting) interaction with patients. These skills and associated experiences are shared with multidisciplinary colleagues, for example within sonography (midwives, physiotherapists), barium swallows (speech and language therapists) and nuclear medicine (technologists, nurses) to name but a few.[55] Whereas the identification of abnormalities or curiosities during imaging falls neatly within clinical reporting, the influence of examination-level activities are often not explored. Radiography-specific case reports may provide an outlet for novel findings related to imaging technique, patient interaction, and equipment-related issues across imaging modalities (Table 1). Diagnostic radiographers, alongside their multidisciplinary colleagues, could capitalise on unexpected examination-level scenarios traditionally not captured within research publications. Rather than supplanting the traditional topics within medical case reports, radiography-specific case reports would frame learning points to inform or reaffirm good radiography practice.

If radiography-specific case reports capitalise upon unfortunate patient care or staff safety a reluctance to publish may occur, especially when accepting error. In this respect, staff have a professional and statutory obligation through the duty of candour to be open and honest when something has gone wrong with provision

Table 1
Potential avenues for radiography-specific case reports.

Where?	Within any radiology imaging modality
Who?	Involving service users, carers, members of the public, healthcare staff and students
What?	Clinical emergency; expected and unexpected
	Communication issues; at individual and group level
	Equipment error, failure or incompatibility
	Equipment preparation; failure to, or vindication of
	Examination technique; novel, incorrect or adapted
	Medical history and contraindications, including phobias
	Patient cooperation; prior, during or after imaging
	Patient experience; both negative and positive
	Patient preparation; failure to, or vindication of
	Post-processing of imaging; novel, incorrect or adapted
When?	Occurring before, during or after the imaging event
Why?	Impact upon patient care or the safety of other persons

of care, treatment or other services.[56,57] Unintended or unexpected events involving healthcare professionals which result in death, moderate/severe harm, moderate increase in treatment, prolonged pain or psychological harm may qualify as notifiable safety incidents. In which case, the staff involved are required to offer an apology (not an admission of guilt) and record an account of the event with accurate facts. Logically, such an account would assist mandatory reflective practice[46,47] and form the basis of a case report. Ethically, the exploration and publication of errors would have higher morality than limiting the experience to local culture. Mass publication of radiation incidents and radiology never events[58] would conversely be unsuitable as a degree of originality, and associated teaching points, would be necessary. The encouragement of case reports to evidence examination-level scenarios would not celebrate errors but positively impact radiographic practice through their dissemination. The College of Radiographers Research Strategy promotes annual staff appraisals to evaluate engagement with evidence-based practice.[17] As a structured and brief research format, case reports may offer a realistic option for the radiography workforce to critically reflect upon incidents. Furthermore, forging a strong professional identity with radiography-specific content may foster a research culture at grassroot-level to combat low authoring rates among HCPC registered radiographers.[18]

A final consideration should be given to the structure and alternative outlet for radiography-specific case reports. Within medical journals, efforts have been made to standardise the structure and content of case reports with consensus-based guidelines for general and specific specialities.[59,60] The inclusion of key information in a recommended format with a suitable discussion is advised to reduce inconsistencies and incomplete reporting.[1] Many of these recommendations may be incorporated and tailored for a clinical reflection in radiography, with a basic structure including a title, abstract, introduction, case presentation, discussion and conclusion. In keeping with other healthcare professions, a consensus-based approach within radiography may be necessary to harmonise content and style. As a profession which entwines patient care with technological expertise, a counterargument may be made for the adoption of technical notes as an alternative research output. Often marginally longer than a case report, technical notes explore a specific development, technique or procedure with practical applications in the clinical setting.[61] Authors may include data which is too limited for submission as a research article but is accompanied with materials and methods. Examples within radiography include management of COVID-19 patients within radiology[62] and the use of salt pads within magnetic resonance imaging to improve fat suppression.[63] A key differentiator is the prospective nature of technical notes with primary data collection which may have a hypothesis-orientated approach. It must be noted that criteria for technical notes vary greatly between journals and disciplines, leading to discrepancies between what is considered a technical note and full research articles. In contrast, case reports typically rely upon retrospective experience with depiction of specific patient, staff or other persons' involvement. Nonetheless, both forms of research output have merit as short, focussed publications.

Conclusion

This review discussed case reports as a research format and its broad value across healthcare and specifically within diagnostic radiography. They provide precise teaching points based upon uncommon clinical scenarios or innovative interventions using a retrospective approach. Their value within evidence-based medicine is often questioned due to low generalisability of findings, citations, and academic prestige. Within radiography research, there is sparse use of case reports to inform practice, although COVID-19 yielded several well-cited studies which benefit radiographer interpretation of imaging. Nevertheless, the format provides the reader with brief accounts of unusual cases with a critical review of the literature which may spawn more complex research. Case reports have also been used within education to foster academic writing and clinical problem-solving skills using a case-study approach. Authors benefit from lower time and word count burdens when compared to traditional research formats, often with quicker publication. The traditional aim of a medical case report, presenting unusual patient diagnosis or treatment, fails to translate directly into the specialist knowledge and skillset of diagnostic radiography. As such, this review suggests radiography-specific case reports as a profession-specific version which focusses upon examination-level experiences. In doing so, case reports provide a realistic opportunity for the workforce to contribute towards the body of knowledge alongside their clinical commitments. Valuable teaching points relevant to radiography practice may be published instead of lost to anecdotes or local culture. With the increasing strive for increased research output, radiography-specific case reports may also provide a springboard for aspiring practitioners seeking larger projects.

Conflict of interest statement

None.

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