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Mapping the cited evidence of ductal carcinoma *in situ* from the 5th edition of the World Health Organisation classification of tumours of the breast

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Aims: Ductal carcinoma *in situ* (DCIS) is recognised by the World Health Organisation (WHO) Classification of Tumours (WCT) as a non-invasive neoplastic epithelial proliferation confined to the mammary ducts and lobules. This report categorises the references cited in the DCIS chapter of the 5th edition of the WCT (Breast Tumours) according to prevailing evidence levels for evidence-based medicine and the Hierarchy of Evidence for Tumour Pathology (HETP), identifying potential gaps that can inform subsequent editions of the WCT for this tumour.

Methods and results: We included all citations from the DCIS chapter of the WCT (Breast Tumours, 5th edition). Each citation was appraised according to its study design and evidence level. We developed our map of cited evidence, which is a graphical matrix of tumour type (column) and tumour descriptors (rows). Spheres were used to represent the evidence, with size and colour corresponding to their number and evidence level respectively. Thirty-six publications were retrieved. The cited literature in the DCIS chapter comprised mainly case series and were regarded as low-level. We found an unequal distribution of citations among tumour descriptors. 'Pathogenesis' and 'prognosis and prediction' contained the most references, while 'clinical features', 'aetiology' and 'diagnostic molecular pathology' had only a single citation each. 'Prognosis and prediction' had the

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Abbreviations: CEBM, Centre for Evidence-Based Medicine; DCIS, Ductal carcinoma in-situ; EBM, evidence-based medicine; EGM, evidence gap map; HETP, Hierarchy of Evidence for Tumour Pathology; JIF, journal impact factor; JSON, JavaScript Object Notation; LCIS, lobular carcinoma in-situ; PMIDs, PubMed ID; RCT, randomized controlled trials; WCT, WHO Classification of Tumours; WHO, World Health Organization.

greatest proportion of moderate- and high-levels of evidence.
Conclusion: Our findings align with the disposition for observational studies inherent in the field of pathology. Our map is a springboard for future efforts in mapping all available evidence on DCIS, potentially augmenting the editorial process and future editions of WCTs.

Keywords: breast tumours, ductal carcinoma *in situ*, evidence mapping, tumour classification

Introduction

Ductal carcinoma *in situ* (DCIS) is recognised as a non-invasive neoplastic epithelial proliferation localised to the mammary ducts and lobules by the World Health Organisation (WHO) Classification of Tumours.[1] The WHO Classification of Tumours (WCT), or the WHO Blue Books, provides international guidelines on tumour classification and diagnosis. The content is formulated by expert authors and periodically updated. Now in its fifth edition, an editorial board comprising standing and expert members oversaw expert authors writing the chapter on DCIS, updating the information based on latest evidence, incorporating consensus among the authors that reduces the risk of including biased information.[2]

Evaluating the evidence for the WCT however, has several challenges. First, information overload from the high volume of publications and multiple fields (such as molecular genetics) hampers timely evaluation.[3] Secondly, data collection and reporting methods among publications lack consistency.[4] There is a paucity of implementation of evidence-based medicine (EBM) principles in pathology, and efforts are needed to adapt and promote their application.[3] Furthermore, randomised controlled trials (RCTs), which are highly regarded in the traditional hierarchy of EBM, are rarely suitable for pathology.

To circumnavigate these challenges, the international WCT EVI Map project was launched, an essential part of which was the recent development of Hierarchy of Evidence for Tumour Pathology (HETP), aiming to augment the expert-led editorial process and to align it with evidence-based practice.[5,6] Currently, expert authors are responsible for choosing relevant literature to support their content. With an evidence-based system that includes the strength of the evidence, the subjectivity in study selection and interpretation can be reduced. It provides a structured approach to ensure that higher level evidence literature is not overlooked and assists in evaluating complicated data. Reference points afforded by evidence-based practice can prevent imbalances in contributions from panel members based on individual preferences.[2]

Evidence gap maps (EGMs) are fundamental tools to developing such evidence-based decision-making products.[7,8] An EGM provides a visual summary, on a user-friendly interface, of existing evidence of a particular field.[9] It employs the transparent and rigorous steps of a systematic review and identifies literature gaps, directing research priorities to plug gaps and influence healthcare policies.[8,10] We created a map of cited evidence that summarises the references in the DCIS chapter of the WHO Classification of Tumours of the Breast. This mapping exercise involves ranking evidence in a hierarchy, which is part of the EBM process. While our map is not strictly an EGM as it does not incorporate the latter's systematic search of multiple databases and screening against inclusion/exclusion criteria, more limited maps produced by reviewing cited evidence in the WCT can highlight relevant shortcomings and serve as a precursor to a formal EGM for research and clinical practice.[11] A clearer understanding of the evidence hierarchy and EBM practices may also inform how studies could be better designed in the future.

Evidence synthesis on DCIS ranges from literature reviews[12–14] and narrative reviews[15–18] to systematic reviews, including those with meta-analyses,[19–21] and an evidence map on DCIS management options.[22] There has yet to be a complete map of all existing DCIS literature. To our understanding, this is the first study that maps, categorises and evaluates evidence on DCIS in the 5th edition WCT of the Breast.

Materials and methods

Our framework consisted of columns defined by tumour type, and rows corresponding to tumour descriptor subheadings as reported in the 5th edition WCT. The tumour descriptors were categorised into localisation, clinical features, epidemiology, aetiology, pathogenesis, macroscopic appearance, histopathology,

cytology, diagnostic molecular pathology, staging and prognosis and prediction.

SEARCH AND SELECTION

All citations in the DCIS chapter of the 5th edition WCT of the Breast were included and exported into Microsoft Excel. Hence, no formal search and selection of literature nor exclusion criteria were required for this study. An evidence classification system adapted from the Centre for Evidence-Based Medicine (CEBM) of the University of Oxford (prevailing evidence levels) was used to appraise the included studies.[3,23,24] The studies were accorded one of four categories of evidence levels based on their methodological design in relation to their methodological quality and risk of bias. Systematic reviews and RCTs were considered high-level; cohort and case studies were moderate-level; cross-sectional studies, case series, case reports, narrative review or expert opinion were low-level; and basic research or classification were unclassifiable.

References were ranked with the HETP separately to compare with the adapted CEBM framework.[6] It consists of five levels of evidence, with level P1 having the greatest confidence and level P5 the lowest, with 'P' referring to 'pathology'. Citations in the lobular carcinoma *in situ* (LCIS) chapter of the 5th edition WCT were selected for comparison with our chapter of interest. Cited references in the DCIS chapter of the 4th edition WCT were also appraised for a relative comparison between the two editions.

DATA EXTRACTION AND CODING

Full-text publications of all included citations were accessed. The study design/type of evidence and level of evidence for each citation were evaluated by two independent reviewers (C.W.J.W. and V.C.Y.K.) using standardised data extraction forms in Microsoft Excel. Relevant information on study characteristics such as the title, PubMed ID (PMIDs), journal impact factor (JIF) and tumour descriptor (under which the particular citation was found in the chapter) were also extracted and recorded. Discordances between the two reviewers were reconciled by consulting the workgroup.

We used EPPI-Reviewer (https://eppi.ioe.ac.uk/),[25] a web-based tool which assists the performance of all types of literature review, including systematic reviews and meta-analyses. All citations were imported into EPPI-Reviewer by entering their corresponding string of PMIDs into the 'Search PubMed' function. Each citation was presented as an item containing its respective PMID, author, title and publication year in the 'Citations' tab. Full-text publications were manually uploaded to each item accordingly.

A coding tool was built. Three main categories (breast, tumour descriptors, evidence levels) and their subcategories were created using the 'Add Child' function. Using the 'Assign code' function, each citation was designated its appropriate subcategories from all three main categories. A JavaScript Object Notation (JSON) report was then generated using the 'Coding Report' function.

DATA PRESENTATION

The DCIS and LCIS map is a visual bubble map created with the JSON file and the EPPI-Mapper tool. Spheres, representing citations, may be found in the cross-section between tumour type and the relevant tumour descriptor. The size of the sphere indicates the number of citations, and the colour shows the level of evidence (red for low, blue for moderate, green for high and orange for unclassifiable). The evidence levels also act as filters. As an interactive map, hovering over a cross-section reveals its exact number of publications per level of evidence and clicking opens a pop-up window showing the relevant list of publications and abstracts.[26]

LITERATURE SURVEY ON DCIS

A literature search was conducted in PubMed to approximate the number of DCIS publications. Included studies were those published in English from 1989 to February 2019. This time-frame matched that of the literature cited in the DCIS chapter of the 5th edition WCT. For further comparison, the studies published in 2019 up to February, were evaluated based on their study types, corresponding to the latest citation in the DCIS chapter published in the 5th edition WCT in February 2019.

Results

SPREAD OF EVIDENCE TYPE AND LEVEL IN THE DCIS CHAPTER

We retrieved 36 journal publications from the DCIS chapter of the 5th edition of WCT of the Breast. Case series (18 of 36, 50%) was the most common evidence type in this chapter. Others included a protocol (one of 36, 3%), narrative reviews (three of 36, 8%), case–control studies (three of 36, 8%), cohort studies (seven of 36, 19%), systematic reviews (one of 36, 3%) and RCTs (three of 36, 8%). There was high inter-rater

reliability, with a percentage agreement of 91% (33 of 36) between the two reviewers.[27] Only three citations differed on reviewer assignment of type of evidence, primarily dichotomising between cohort study and other types. For evidence levels, low-level formed the majority (58%), followed by moderate-level (28%), high-level (11%) and unclassifiable (3%) (Table 1).

QUANTITY OF EVIDENCE BASED ON TUMOUR DESCRIPTORS

As seen in the map (Figure 1), the citations in the DCIS chapter were distributed unequally among the tumour descriptors. We found that 'pathogenesis' had the greatest number of citations (12 of 36, 33%) and showed the largest sphere on the map. 'Prognosis and prediction' (10 of 36, 28%) and 'histopathology' (nine of 36, 25%) followed closely. Conversely, 'clinical features', 'aetiology', and 'diagnostic molecular pathology' had the lowest, each with a single citation (Figure 2A). Both figures showed the absence of cited evidence for 'localisation', 'macroscopic appearance', 'cytology' and 'staging'.

QUALITY OF EVIDENCE BASED ON TUMOUR DESCRIPTORS

The citations under 'clinical features' and 'aetiology', a case series and a narrative review, respectively, were only of low-level evidence. The majority of the cited evidence under 'pathogenesis' (nine of 12, 75%) and 'histopathology' (eight of nine, 89%) were also of low level, predominantly comprising case series.

Conversely, 'prognosis and prediction' had the highest proportion of citations with moderate (six of 10, 60%) or high (three of 10, 30%) levels of evidence. For this tumour descriptor, its moderate-level evidence comprised mainly cohort studies, while its high-level evidence comprised all RCTs. Only one systematic review,[21] under 'epidemiology', was cited in the entire DCIS chapter (Figure 2A).

COMPARISON WITH ANOTHER CHAPTER

The LCIS chapter had a comparable length and was written by different authors. Furthermore, DCIS and LCIS are types of pre-invasive intra-epithelial neoplasms of the breast,[28] making the LCIS chapter an ideal comparative selection.

Comparing across tumour descriptors

Similar to the DCIS chapter, the LCIS chapter had an unequal spread of citations across tumour descriptors (Table 2). Both chapters possessed the same top three tumour descriptors with the most citations, namely 'pathogenesis', 'histopathology' and 'prognosis and prediction' (Figure 2A, Supporting information, Figure S1). However, unlike the DCIS chapter, the majority of citations in the LCIS chapter were found under 'prognosis and prediction'. Further, the DCIS chapter contained fewer citations (n = 36) than the LCIS chapter (n = 123), excluding any repeated citations.

Comparing level of evidence

Low levels of evidence predominated in both DCIS and LCIS chapters (58 and 81%, respectively).

Table 1. Number of citations for each type and level of evidence, in the DCIS chapter of the 5th edition of the World Health Organisation (WHO) Classification of Tumours (WCT) of the Breast

		Level of evidence			
Type of evidence	*n*	Low	Moderate	High	Unclassifiable
Narrative review	3 (8%)	3	0	0	0
Case series	18 (50%)	18	0	0	0
Case–control	3 (8%)	0	3	0	0
Cohort study	7 (19%)	0	7	0	0
Systematic review	1 (3%)	0	0	1	0
Randomised controlled trial	3 (8%)	0	0	3	0
Protocol	1 (3%)	0	0	0	1
Total	36	21 (58%)	10 (28%)	4 (11%)	1 (3%)

DCIS, ductal carcinoma *in situ*.

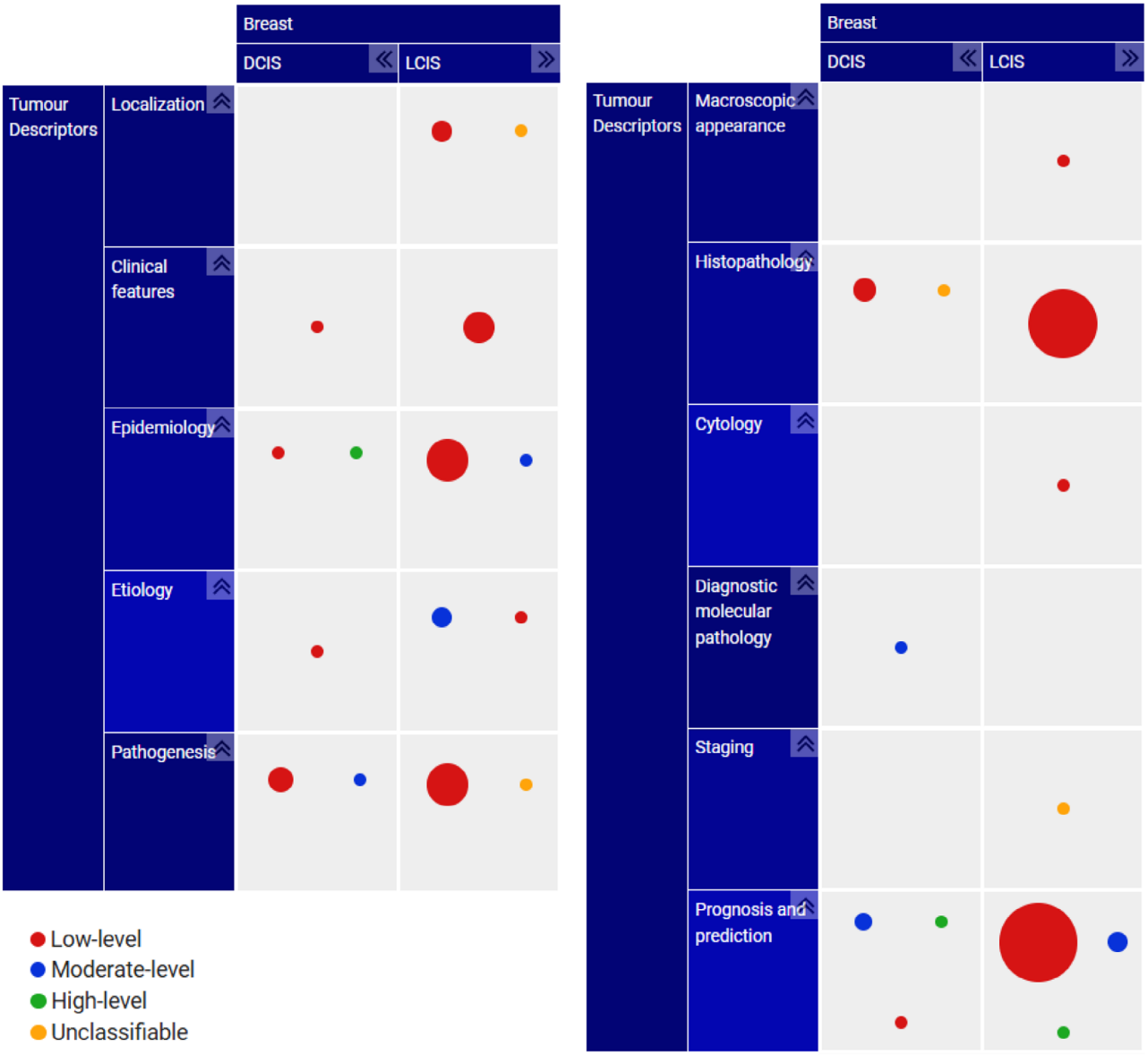

Figure 1. Evidence map of ductal carcinoma *in situ* and lobular carcinoma *in situ* references in the World Health Organisation (WHO) Classification of Tumours (WCT) of the Breast (5th edition). The map is divided into two parts here for the purpose of illustration. The size and colour of each sphere reflect the number of publications and the evidence level of a publication, respectively; namely, red for low-level evidence, blue for medium-level evidence, green for high-level evidence and orange for unclassifiable evidence.

Notably, the DCIS chapter had a higher proportion of citations with moderate and high levels of evidence (28 and 11%, respectively) compared to the LCIS chapter (12 and 5%, respectively) (Table 3).

COMPARISON WITH THE HETP FRAMEWORK

The high-level evidence citations were classified as level P1 for the single systematic review and level P2 for the three RCTs. All case–control and cohort studies (n = 10) were assigned level P3 with similar moderate-level evidence. As for case series with a low level of evidence, the majority (17 of 18, 94%) were of level P4 under 'clinical features', 'epidemiology', 'pathogenesis', 'histopathology' and 'diagnostic molecular pathology', but one was regarded as level P5 under 'prognosis and prediction'. Narrative reviews and protocols were excluded as evidence under this new hierarchy (Figure 2B).

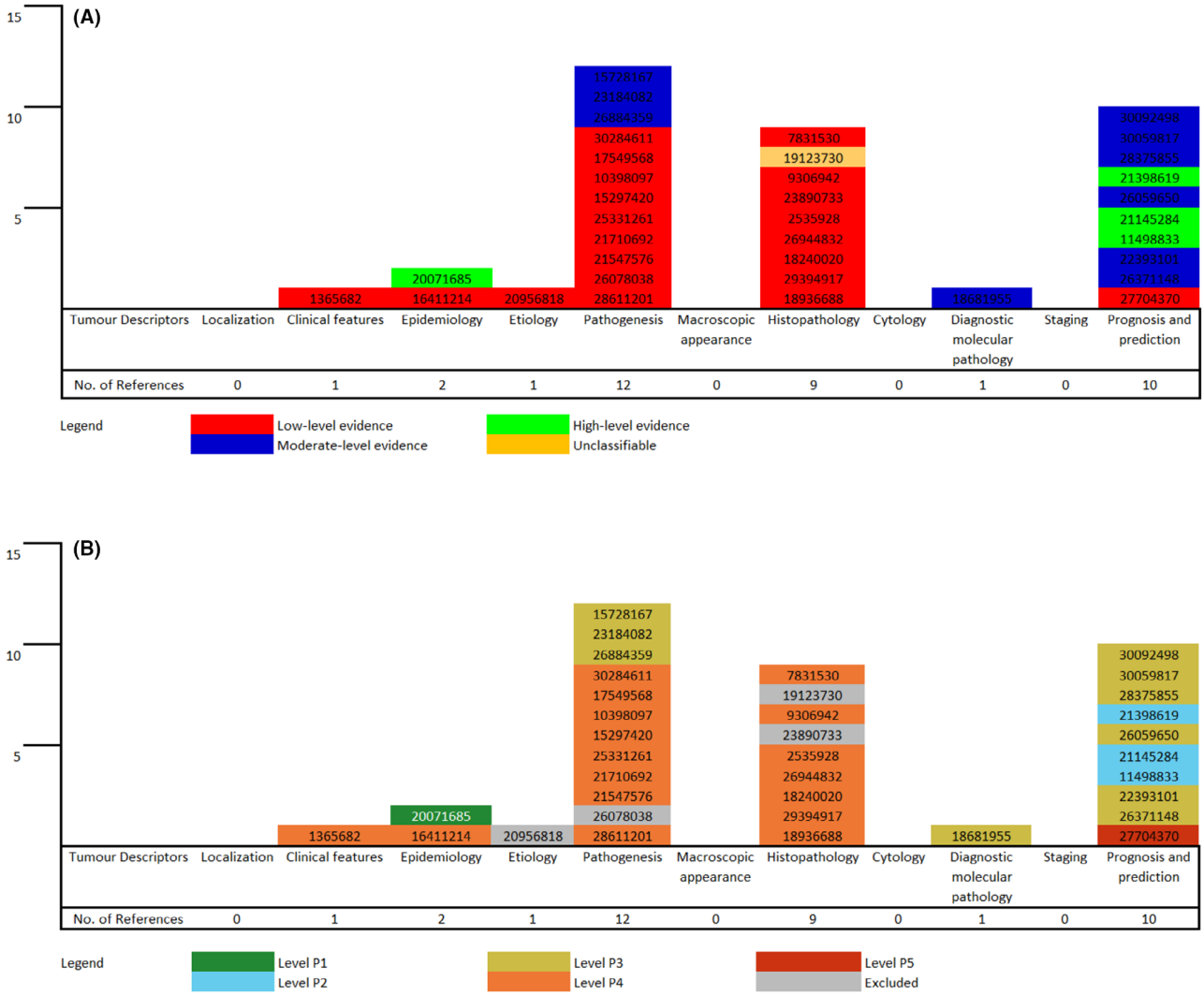

Figure 2. Bar charts depicting the number of citations and their PubMed IDs (PMID) for each tumour descriptor for the ductal carcinoma *in situ* chapter. Each citation is coloured depending on its level of evidence. Bar charts are generated according to (**A**) the evidence level adapted from the Centre for Evidence-Based Medicine (CEBM) of the University of Oxford and (**B**) the newly proposed Hierarchy of Research Evidence for Tumour Pathology (HETP).

COMPARISON WITH DCIS AND LCIS LITERATURE SEARCH

The DCIS chapter contained 36 citations published between 1989 and February 2019. Our literature search on PubMed yielded 3522 publications from the same time range, excluding non-English ones. Figure 3 shows the consistent increments in the number of DCIS publications at approximately 10-year intervals, from 395 in 1989–99 to 2281 in 2010–19. In January and February 2019, there was a total of 72 publications and one retracted study. The majority were case series (34 of 72, 47%) and had a low level of evidence (52 of 72, 72%), similar to the DCIS chapter of the 5th WCT. Other evidence types included cohort studies (13 of 72, 18%) and basic research (11 of 72, 15%). Systematic reviews, case reports, literature reviews and expert opinions comprised two publications each (two of 72, 3%) while RCT, narrative review and educational case had one publication each (one of 72, 1%) (Table 4).

Our LCIS literature search on PubMed yielded 793 publications between 1989 and February 2019, which is significantly fewer than the yield in our DCIS literature search in the same time-period (Figure 3). DCIS publications increased at a significantly

Table 2. Number of citations for each tumour descriptor in the DCIS and LCIS chapters of the 5th edition of the World Health Organisation (WHO) Classification of Tumours (WCT) of the Breast

	No. of references	
Tumour descriptors	DCIS	LCIS
Localisation	0	9
Clinical features	1	11
Epidemiology	2	19
Aetiology	1	10
Pathogenesis	12	17
Macroscopic appearance	0	2
Histopathology	9	24
Cytology	0	3
Diagnostic and molecular pathology	1	0
Staging	0	2
Prognosis and prediction	10	55
Total	36	152

DCIS, ductal carcinoma *in situ*; LCIS, lobular carcinoma *in situ*.

Table 3. Number of citations for each level of evidence in the DCIS and LCIS chapters of the 5th edition of the World Health Organisation (WHO) Classification of Tumours (WCT) of the breast

	No. of references	
Level of evidence	DCIS	LCIS
Low	21 (58%)	100 (81%)
Moderate	10 (28%)	15 (12%)
High	4 (11%)	2 (2%)
Unclassifiable	1 (3%)	6 (5%)
Total	36	123

DCIS, ductal carcinoma *in situ*; LCIS, lobular carcinoma *in situ*.

higher rate than LCIS publications during the three decades. A low level of evidence predominated in both DCIS and LCIS literature from January to February 2019, largely comprising case series. Notably, DCIS literature throughout these 2 months had a greater proportion of moderate and high-level studies compared to LCIS literature (Supporting information, Table S1).

COMPARISON WITH 4TH WCT AND JOURNAL IMPACT FACTORS

The DCIS chapter in the 4th edition WCT (Breast) had more cited references (n = 48), with fewer studies of moderate-level evidence (17%) and more high-level evidence (19%). Only a few studies (five of 48, 10%) were cited again in the 5th edition WCT. Studies of moderate-level and high-level evidence in the DCIS chapter of the 5th edition WCT had a higher proportion of publications in journals with higher JIF (> 10) (40 and 75%, respectively), compared to those with a low level of evidence (29%) (Supporting information, Tables S2 and S3).

Discussion

Our map visualises the presence, absence and quality of evidence from the DCIS chapter of the 5th edition WCT of the Breast. Notably, we found that the majority of citations were regarded as low-level evidence and were largely case series. Similarly, in a study by Crawford analysing the top 150 references on liver biopsy interpretation published between 1948 to 2002, more than half (57%) were noted to be case series authored by renowned experts.[29] We thus recognise the inherent disposition for observational studies in the field of pathology.[30,31] This predilection for observational studies is understandable in tumour pathology research, given how experimental designs are less equipped for evaluating diagnostic criteria.

Experimental designs such as RCTs are uncommon in tumour pathology research due to the technical and ethical challenges posed by randomisation[30] and their inability to evaluate diagnostic criteria.[32] Low academic productivity due to suboptimal faculty funding and errors arising from 'interobserver variation' in biopsy interpretation may result in less high-level evidence synthesis available.[3,33] Meta-analysis may not be helpful in this field, as the pathologist's focus is on diagnosis rather than clinical outcomes.[33] Our findings aligned with the existing literature, showing that only the minority of the citations in the DCIS chapter were high-level evidence.

We further noted that 'pathogenesis' had the greatest number of citations in the chapter. This may allude to the significance of DCIS as a precursor of invasive breast carcinoma and thus the need to substantiate current findings that add to the ongoing elucidation of its evolutionary pathway.[17] In contrast, 'localisation', 'macroscopic appearance', 'cytology' and 'staging' had no citations. It could be because

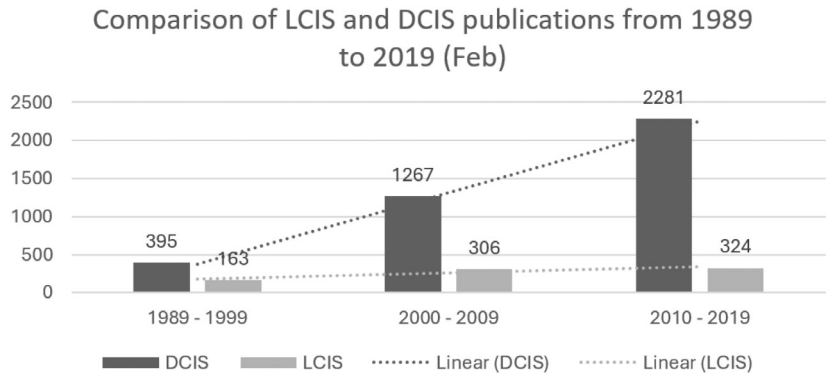

Figure 3. Comparing distribution of ductal carcinoma *in situ* and lobular carcinoma *in situ* publications found in PubMed from 1989 to 2019 (February).

they are common knowledge to pathologists in the case of 'localisation' and 'staging' (i.e. DCIS is stage 0 or Tis), or inapplicable in the case of 'cytology and 'macroscopic appearance', as DCIS is a difficult diagnosis to render on cytology and macroscopic appearance can be subtle or non-specific.

The LCIS chapter contained more citations than the DCIS chapter. This may be because LCIS has recently recognised subtypes of pleomorphic and florid forms, which are generating interest and discussion as data on these continue to emerge, with as yet uncertainty on universally agreed management approaches.[34] The expert authors for the LCIS chapter were different from the DCIS chapter, and may have had different approaches in the selection of references. The DCIS chapter had a higher proportion of moderate- and high-level evidence than the LCIS chapter. Unlike DCIS, LCIS is relatively less common[35] and is usually an incidental finding on biopsy,[36] making study designs with moderate-level evidence, such as cohort studies, or with high-level evidence, less accessible. Additionally, only five studies (five of 48, 10%) previously cited in the 4th edition WCT were cited again in the 5th edition WCT. A possible reason could be that the majority of the citations (33 of 48, 69%) in the 4th edition WCT were published before 2010; thus, more recent evidence was incorporated.

With the first evidence map published in 2003 by Kaz *et al.*,[9,37] it is now frequently implemented to guide decision-making in public health and social science as a rapid form of systematic review capable of handling large numbers of papers.[5] A systematic review by Miake-Lye *et al.*[38] retrieved 39 published maps from 2003 to 2015, none of which were for pathology. The year 2022 saw the first efforts in evidence mapping in pathology by Del Aguila Mejıa *et al.*,[5] who published a protocol to map the evidence in the 5th edition WCT of the Lung. Adapting its methodology, Md Nasir *et al.*[24] mapped the evidence in the phyllodes tumour chapter of the WCT of the Breast. A similar method was used to develop our DCIS map, with additional evidence ranking via HETP. While expert opinions and narrative reviews used to be low-level evidence, these are not counted as evidence in the latter, together with other publications such as commentaries and study protocols. Cross-sectional studies are now regarded as level P3 under the HETP (with the same evidence-level as retrospective cohort studies), instead of being classified as low-level. Future work in appraising the literature could consider adopting this new hierarchy.[6] We also used similar tools (EPPI-Reviewer and EPPI-Mapper) in our two previous studies[5,24] instead of other web-based EGM applications, as they best support our project requirements.

Evidence mapping in oncology has also seen an expansion beyond cancer treatments[39–48] to include molecular pathogenesis,[49] risk factors,[50,51] complications[52] and nutritional intervention.[53] Nicholson *et al.*[54] proposed the usage of citation index and tools that incorporate artificial intelligence in helping researchers to find relevant scientific literature, as searching for the most highly cited papers in an area of interest is one of the possible approaches for sifting and dealing with massive numbers of publications. While these may provide a list of suitable papers, they do not assess the quality of evidence or minimise bias in the identification and selection of evidence. Our assessment on JIFs also reflects Heidenreich *et al.*'s[55] findings that observational studies of low-level evidence tend to be published in lower-impact journals, while RCTs are published in higher-impact journals.

Our report has several limitations. First, there may be unintended bias in selecting citations because authors contributing to the WHO Blue Books may

Table 4. Number of citations for each type and level of evidence from DCIS literature search on PubMed, filtered for January to February 2019. Total is taken as $n = 72$, excluding the retracted publication

		Level of evidence			
Type of evidence	*n*	Low	Moderate	High	Unclassifiable
Case series	34 (47%)	34	0	0	0
Case report	2 (3%)	2	0	0	0
Literature review	2 (3%)	2	0	0	0
Narrative review	1 (1%)	1	0	0	0
Expert opinion	2 (3%)	2	0	0	0
Basic research	11 (15%)	11	0	0	0
Case–control	3 (4%)	0	3	0	0
Cohort study	13 (18%)	0	13	0	0
Systematic review	2 (3%)	0	0	2	0
Randomised controlled trial	1 (1%)	0	0	1	0
Fictional educational case	1 (1%)	0	0	0	1
Retracted publication	1 (1%)	0	0	0	1
Total (excluding retracted publication)	72 (100%)	52 (72%)	16 (22%)	3 (4%)	1 (1%)

DCIS, ductal carcinoma *in situ*.

have included articles that they were involved in, and chose studies conforming to their views or which are familiar to them. In this DCIS chapter, three authors were involved in a total of six papers amounting to 17% of the total citations. Secondly, the citations of the DCIS chapter from the WCT of the Breast comprised only 1% of the DCIS literature for the same time-frame. However, we recognise that it is impracticable to include all available publications. Thirdly, while our map is limited to citations from the DCIS chapter of the WHO Blue Books, there is potential for future work to include DCIS literature beyond those encompassed in the 5th edition. By incorporating studies with higher-quality evidence, the WCT is poised for a more evidence-based approach. Lastly, while our map displayed a single column of DCIS and rows of tumour descriptors, we recognise that DCIS is not a single entity and is highly heterogeneous histologically, biologically, genetically and clinically.[1] We did not group the evidence according to these subcategories (e.g. architectural pattern: solid, cribriform, micropapillary or papillary types) and followed the WCT format.

Our map differs from a standard EGM in that it provides a graphical overview of the evidence as cited and thereby limited to the DCIS chapter of the 5th edition WCT of the Breast, although assessed from full papers. It highlights a lack of citation of high-level evidence studies. It is acknowledged that the current hierarchy of clinical evidence levels may not be well suited to the discipline of pathology: our recent related publication is intended to establish more appropriate and relevant categorisation for pathology.[6] Our current DCIS map is a springboard for future endeavours to map all available evidence on DCIS. It is a critical building block to develop future editions of the WCT underscored by strong evidence-based practices, which will empower stakeholders' decisions and optimise the diagnosis, management and outcomes for all patients with DCIS.

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Conflicts of interest

The authors declare no conflicts of interest.

Disclaimer

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Data availability statement

The data that support the findings of this study are available in the article.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Bar charts depicting the number of citations and their PubMed IDs (PMID) for each tumour descriptor for LCIS chapter. Each citation is coloured red for low-level of evidence, blue for moderate-level of evidence, and orange for unclassifiable.

Table S1. Number of citations for each type and level of evidence from LCIS literature search on PubMed, filtered for January to February 2019.

Table S2. Journal impact factor of the cited evidence in DCIS chapter (based on Journal Citation Reports from 2022 to 2023, as indicated on websites of respective journals).

Table S3. Proportion of journals with JIF higher than 10 for the cited evidence in DCIS chapter.