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Interventions to support under-represented nurses, midwives and allied health professionals into research careers: A realist synthesis of what works, for whom, and under what circumstances

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Systematic Review

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Interventions to support under-represented nurses, midwives and allied health professionals into research careers: A realist synthesis of what works, for whom, and under what circumstances

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Abstract

Background: Nurses, midwives and allied health professionals (NMAHPs) remain under-represented within clinical academic careers relative to the medical workforce, and existing evidence largely describes barriers and facilitators without explaining how, why, for whom and under what circumstances interventions succeed. The review aimed to develop and refine programme theory explaining how interventions support under-represented NMAHPs to access, progress and sustain clinical academic careers. **Methods:** A realist synthesis, prospectively registered with the Open Science Framework (DOI: 10.17605/OSF.IO/JS9CH) and reported in accordance with RAMESES standards, was conducted. Six electronic databases (PubMed/MEDLINE, Scopus, Web of Science, ScienceDirect, CINAHL and Embase) were searched from database inception to May 2026, supplemented by website and citation searching. Eligible qualitative, quantitative, mixed-methods and grey literature sources were appraised using design-specific tools and synthesised iteratively into context-mechanism-outcome configurations using abductive and retroductive reasoning. **Results:** Seventeen studies met the inclusion criteria. Forty-two context-mechanism-outcome configurations were consolidated into sixteen programme theories across four higher-order explanatory domains: initiating clinical academic careers; sustaining progression and retention; the organisational and funding circumstances under which interventions succeed or fail; and equity, recognition and embedded clinical academic practice. Progression was found to depend on cumulative interaction between individual, organisational and system-level resources, including research internships, structured career pathways, fellowships, mentoring, funding support and embedded research roles, rather than on isolated interventions or individual motivation alone. **Conclusions:** Equitable clinical academic progression for under-represented NMAHPs requires coordinated, longitudinal interventions that combine individual capability-building with organisational commitment, transparent funding pathways and inclusive leadership. This programme theory offers an evidence-informed basis for designing and evaluating future clinical academic career interventions.

Keywords: clinical academic careers; nurses, midwives and allied health professionals; realist synthesis; research capacity building; workforce equity; mentoring

Background:

Clinical academic careers are widely recognised as an essential mechanism for strengthening research capacity, accelerating knowledge translation and improving the quality and safety of healthcare through the integration of research and clinical practice [1–3]. Nurses, midwives and allied health professionals (NMAHPs) play a pivotal role in this agenda because they are uniquely positioned to identify clinically relevant research questions, generate practice-based evidence and translate research findings into routine patient care [4, 5]. Increasing the number of research-active NMAHPs has therefore become a strategic priority within the United Kingdom to enhance healthcare innovation, workforce capability and patient outcomes [6–8]. Despite substantial investment through initiatives such as the NIHR Integrated Clinical Academic Programme, internships, fellowships and doctoral pathways, the NMAHP clinical academic workforce remains considerably underdeveloped compared with the medical clinical academic workforce [9, 10]. Evidence consistently identifies fragmented career pathways, inadequate protected research time, inconsistent organisational support, limited mentoring, insufficient research infrastructure and restricted funding opportunities as major barriers to clinical academic progression [11–13]. Furthermore, these barriers disproportionately affect under-represented groups, including Global Majority and ethnic minority clinicians, who continue to experience inequitable access to mentoring, leadership opportunities, research funding and career progression because of structural and organisational inequalities [14, 15]. In this synthesis, the term under-represented is used in a deliberately dual sense: it denotes NMAHPs as professions that remain under-represented within clinical academic careers relative to medicine, and, within that workforce, the groups (including Global Majority and ethnic minority clinicians) who face additional structural barriers to research participation and progression. Both forms of under-representation are documented: NMAHPs hold proportionally far fewer clinical academic posts than their medical colleagues [9, 10], and inequitable access within the workforce is reported for Global Majority and ethnic minority clinicians [14–16]. A 2025 report commissioned by the Office for Strategic Coordination of Health Research reached a similar conclusion for the clinical academic workforce as a whole, identifying unclear career pathways as a barrier to participation [17]. In response, UK research funders introduced a national clinical research career pathway framework in 2025-2026, mapping funding opportunities across career stages and recognising that progression is not necessarily linear.

Although previous research has identified numerous facilitators and barriers to clinical academic careers, the evidence remains largely descriptive and programme-specific, providing limited explanation of how, why, for whom and under what circumstances interventions are successful [18–20]. Evaluations have commonly focused on individual initiatives, such as fellowships or mentoring programmes, with less attention to how intervention resources interact with organisational and system contexts to generate mechanisms that influence progression and sustainability across the clinical academic trajectory [21, 22]. Consequently, there remains limited explanatory understanding of how research internships, mentoring, leadership programmes, structured career pathways and funding support may enable or constrain equitable clinical academic progression, particularly among under-represented NMAHPs. To our knowledge, no published realist synthesis has examined these processes across NMAHP clinical academic careers. Ongoing scoping work mapping the range and nature of clinical academic opportunities for nurses further highlights this gap [23].

For the purposes of this review, clinical academic careers were understood as pathways through which NMAHPs combine and develop clinical practice and research, from early research exposure and postgraduate training through to fellowships and substantive clinical academic roles. To address this explanatory gap, the review aimed to identify and synthesise interventions designed to widen participation in clinical academic careers, including internships, fellowships, bridging programmes, mentorship, leadership initiatives and funding-access support. It also sought to develop and refine programme theory explaining how, why, for whom and under what circumstances these interventions support under-represented NMAHPs to access, progress within and sustain clinical academic careers in the United Kingdom. Particular attention was given to the mechanisms influencing research engagement, career progression and leadership development, alongside the organisational, cultural and structural contexts that enable or constrain these mechanisms. The review also examined how research funding pathways, from application and assessment through to award and post-award support, interact with organisational systems to shape equitable participation, retention and advancement.

Methods:

A realist synthesis approach, prospectively registered with the Open Science Framework (OSF; DOI: 10.17605/OSF.IO/JS9CH), was adopted because interventions supporting

clinical academic career development are complex, context-sensitive and embedded within organisational, educational and healthcare systems. Realist synthesis seeks to explain how, why, for whom, and under what circumstances interventions generate outcomes through development of Context-Mechanism-Outcome (CMO) configurations and programme theories [24]. This approach is particularly appropriate because academic progression is shaped by interactions between individual circumstances, mentoring and professional relationships, organisational research infrastructure, funding arrangements, leadership support and wider health-system conditions. Consistent with realist methodology, interventions were conceptualised as resources, while mechanisms represented the responses and reasoning generated when participants encountered those resources within particular contexts. This distinction enabled the review to examine how similar interventions could produce different outcomes across professional and organisational settings, including differences in access, progression and sustainability among under-represented NMAHPs. The review followed the Realist and Meta-narrative Evidence Syntheses: Evolving Standards (RAMESES) publication standards [25], supporting an explanatory synthesis of the multilevel processes shaping research engagement, career progression, individual research capability and organisational research capacity.

1.1 Search Strategy:

A comprehensive and systematic literature search was undertaken to identify studies relevant to clinical academic career pathways for nurses, midwives and allied health professionals (NMAHPs). The search was conducted independently by two reviewers across six electronic bibliographic databases: PubMed/MEDLINE, Scopus, Web of Science Core Collection, ScienceDirect, CINAHL and Embase from database inception to May 2026. The search strategy combined controlled vocabulary (e.g., Medical Subject Headings [MeSH] where available) with free-text keywords and Boolean operators to maximise retrieval of relevant studies. Search terms were developed around three core concepts: (i) clinical academic careers and research capacity, (ii) nurses, midwives and allied health professionals, and (iii) career development, mentoring, leadership and research infrastructure. Database-specific syntax, truncation, phrase searching and field tags were adapted for each platform while maintaining conceptual consistency.

The Embase strategy additionally incorporated a concept block comprising equity, diversity and inclusion terms (Table 1). The complete search strategies for each database are presented in Table 1. No restrictions were applied to study design to ensure the inclusion of qualitative,

quantitative, mixed-methods, programme evaluation and organisational studies relevant to realist synthesis. No language restrictions were applied to the search strategies themselves; however, eligibility was limited to English-language publications involving human participants, and language and full-text availability criteria were applied during the screening process. Following retrieval, references were exported into reference management software for deduplication before screening. Titles, abstracts and subsequently full-text articles, were independently assessed by two reviewers (AV and SS) against predefined eligibility criteria. Any disagreements arising during study selection were resolved through discussion and, where necessary, consultation with a third member of the review team until consensus was achieved, thereby ensuring a rigorous, transparent and reproducible study identification process in accordance with PRISMA 2020 and RAMESES methodological guidance.

Table 1: Search Strategy employed

Database	Search Strategy (Boolean operators)
PubMed (MEDLINE)	*(("Clinical Academic" OR "Clinical Research*" OR "Research Career*" OR "Clinical Academic Career*" OR "Research Capacity" OR "Research Leadership" OR "Research Fellowship*" OR "Research Internship*" OR "Embedded Researcher*" OR "Clinical Academic Pathway*") AND (Nurs* OR Midwi* OR "Allied Health Professional*" OR AHP* OR NMAHP* OR Pharmacist* OR Physiotherapist* OR Occupational Therapist* OR Radiographer* OR "Healthcare Scientist*") AND ("Career Development" OR Mentoring OR Leadership OR Fellowship* OR Internship* OR "Research Capacity Building" OR "Protected Research Time" OR "Research Culture" OR "Research Infrastructure"))**
Scopus	*TITLE-ABS-KEY(("clinical academic" OR "clinical research*" OR "clinical academic career*" OR "research career*" OR "clinical academic pathway*" OR "research capacity" OR "research leadership" OR fellowship* OR internship* OR "embedded researcher*") AND (nurs* OR midwi* OR "allied health professional*" OR AHP* OR NMAHP* OR pharmacist* OR physiotherapist* OR "occupational therapist*" OR radiographer* OR "healthcare scientist*") AND ("career development" OR mentoring OR leadership OR "protected research time" OR "research culture" OR "research infrastructure"))**
Web of Science Core Collection	*TS=(("clinical academic" OR "clinical research*" OR "clinical academic career*" OR "research career*" OR "clinical academic pathway*" OR "research capacity" OR fellowship* OR internship* OR "embedded researcher*") AND (nurs* OR midwi* OR "allied health professional*" OR AHP* OR NMAHP* OR pharmacist* OR physiotherapist* OR "occupational therapist*" OR radiographer* OR "healthcare

	scientist*") AND ("career development" OR mentoring OR leadership OR "research culture" OR "protected research time" OR "research infrastructure"))**
ScienceDirect	*TITLE-ABSTR-KEY("clinical academic" OR "research career" OR fellowship) AND (nurs OR midwi OR "allied health professional") AND (mentoring OR leadership)*
CINAHL (EBSCOhost)	*((MH "Clinical Competence+" OR MH "Research+" OR MH "Career Development+" OR "clinical academic" OR "clinical research*" OR "research career*" OR "clinical academic pathway*" OR "research capacity") AND (MH "Nurses+" OR MH "Midwives+" OR MH "Allied Health Personnel+" OR nurs* OR midwi* OR "allied health professional*" OR NMAHP* OR physiotherapist* OR pharmacist*) AND ("career development" OR mentoring OR leadership OR fellowship* OR internship* OR "research culture" OR "protected research time" OR "research infrastructure"))**
Embase	*('nurse'/exp OR 'midwife'/exp OR 'allied health personnel'/exp OR nurse:ti,ab,kw OR midwi*:ti,ab,kw OR "allied health professional*":ti,ab,kw OR NMAHP*:ti,ab,kw OR AHP*:ti,ab,kw) AND ('research'/exp OR 'clinical academic':ti,ab,kw OR 'clinical academic career*':ti,ab,kw OR 'research career*':ti,ab,kw OR researcher*:ti,ab,kw OR 'clinical academic pathway*':ti,ab,kw) AND (internship*:ti,ab,kw OR fellowship*:ti,ab,kw OR mentor*:ti,ab,kw OR leadership:ti,ab,kw OR coaching:ti,ab,kw OR networking:ti,ab,kw OR 'community of practice':ti,ab,kw OR 'bridging programme*':ti,ab,kw OR doctorate:ti,ab,kw OR PhD:ti,ab,kw OR 'research capacity':ti,ab,kw OR 'research training':ti,ab,kw OR 'protected time':ti,ab,kw OR 'research infrastructure':ti,ab,kw OR funding:ti,ab,kw OR grant*:ti,ab,kw OR 'career development':ti,ab,kw) AND (equity:ti,ab,kw OR inclusion:ti,ab,kw OR diversity:ti,ab,kw OR underrepresented:ti,ab,kw OR under-represented:ti,ab,kw OR 'ethnic minorit*':ti,ab,kw OR 'global majority':ti,ab,kw OR racism:ti,ab,kw OR discrimination:ti,ab,kw OR belonging:ti,ab,kw OR fairness:ti,ab,kw))**

1.2 Study Selection and Quality Appraisal:

Study selection was undertaken in accordance with the predefined eligibility criteria informed by the SPIDER framework and followed an iterative realist synthesis approach. Following the removal of duplicate records, titles and abstracts were independently screened by two reviewers to identify studies potentially relevant to the review question. Full-text articles were subsequently assessed against the inclusion and exclusion criteria, focusing on studies involving NMAHPs that evaluated interventions designed to improve access to, progression within or retention in research and clinical academic careers. Eligible evidence included qualitative, quantitative and mixed-methods studies, programme evaluations, policy documents and relevant grey literature that contributed to programme theory development through the identification of contexts, mechanisms and outcomes. Studies focusing exclusively on professions outside the NMAHP workforce, lacking relevance to clinical

academic career development, or providing insufficient explanatory data were excluded. Disagreements during study selection were resolved through discussion and consensus, with referral to a third reviewer where necessary. Consistent with realist methodology, studies were selected on the basis of both methodological rigour and conceptual relevance, ensuring that evidence contributed meaningfully to the refinement of context-mechanism-outcome configurations and the development of the final programme theories. Design-specific appraisal tools were employed, including the Critical Appraisal Skills Programme (CASP) checklist for qualitative studies [26], the Joanna Briggs Institute (JBI) Analytical Cross-Sectional Checklist for observational studies [27], the Mixed Methods Appraisal Tool (MMAT 2018) for mixed-methods and programme evaluations [28], and the Authority, Accuracy, Coverage, Objectivity, Date, Significance (AACODS) checklist for commentary, conceptual and organisational case study literature [29]. Lower-level evidence and grey literature were retained where they provided valuable mechanistic insights, with methodological limitations reported transparently in the supplementary appraisal tables.

1.3 Categorisation and Theory-Making Framework:

A structured theory-building and categorisation approach was employed to support the development, refinement and validation of programme theories within this realist synthesis. The analysis was guided by realist principles and Context-Mechanism-Outcome (CMO) logic to explain how, why, for whom and under what circumstances interventions influenced equitable access to and progression within clinical academic careers. Initial programme theories (IPTs) were developed through scoping of conceptually rich empirical studies, programme evaluations and policy literature and were iteratively refined as additional evidence was synthesised using abductive and retroductive reasoning. Data were coded inductively to identify emerging explanatory concepts and deductively to develop and refine CMO configurations. Mechanisms were inferred from authors' explanatory accounts and participants' responses, representing the reasoning triggered by programme resources, including perceived career attainability, clinician-researcher identity, organisational legitimacy, psychological safety, belonging, social capital, procedural fairness and confidence in navigating research careers. Outcomes included research engagement, fellowship uptake and success, career progression, research productivity, leadership development, workforce retention, organisational research capacity, knowledge mobilisation and improvements in evidence-based practice. Individual CMO configurations were iteratively compared across studies using constant comparative analysis to identify recurring explanatory patterns (demi-

regularities). Related CMOs were subsequently synthesised into programme theories representing the principal causal explanations underpinning clinical academic career development. Throughout the synthesis, rival explanations, negative cases and variations across organisational and professional contexts were examined to refine the emerging theories and improve explanatory rigour. The higher-order programme theories therefore represent evidence-informed explanatory models describing the causal pathways through which interventions facilitate or constrain equitable participation, progression and sustainability of clinical academic careers among under-represented NMAHPs. A worked example of this analytic audit trail, tracing one programme theory from initial candidate theory through study-level CMO extractions, constant comparison and negative-case testing to its final configuration, is provided in Supplementary Figure S1.

Results:

1.4 Study Selection:

The literature search identified 6,596 records from six electronic databases, comprising PubMed (n = 1,935), Scopus (n = 1,326), Web of Science (n = 840), ScienceDirect (n = 1,161), CINAHL (n = 348), and Embase (n = 986). Following the removal of 2,533 duplicate records, 4,063 unique citations remained for title and abstract screening. During screening, 419 records were excluded because their full texts could not be retrieved and 723 non-English publications were removed in accordance with the predefined eligibility criteria. Consequently, 2,921 full-text reports were assessed for eligibility. Of these, 986 studies were excluded because they did not focus on under-represented nurses, midwives and allied health professionals (NMAHPs) whereas 1,026 records lacked relevant interventions supporting research or clinical academic career development, and 893 records did not report outcomes relevant to programme theory development. Additional searches of organisational websites (n = 24) and citation tracking (n = 53) identified 77 reports, of which 25 underwent full-text assessment after excluding unretrievable records. Following eligibility assessment, 17 studies met the inclusion criteria and were included in the realist synthesis (Figure 1), comprising 16 studies identified through database searching and one study identified through the supplementary website and citation searches. These studies provided the evidence base for developing and refining the context-mechanism-outcome configurations and the final programme theories.

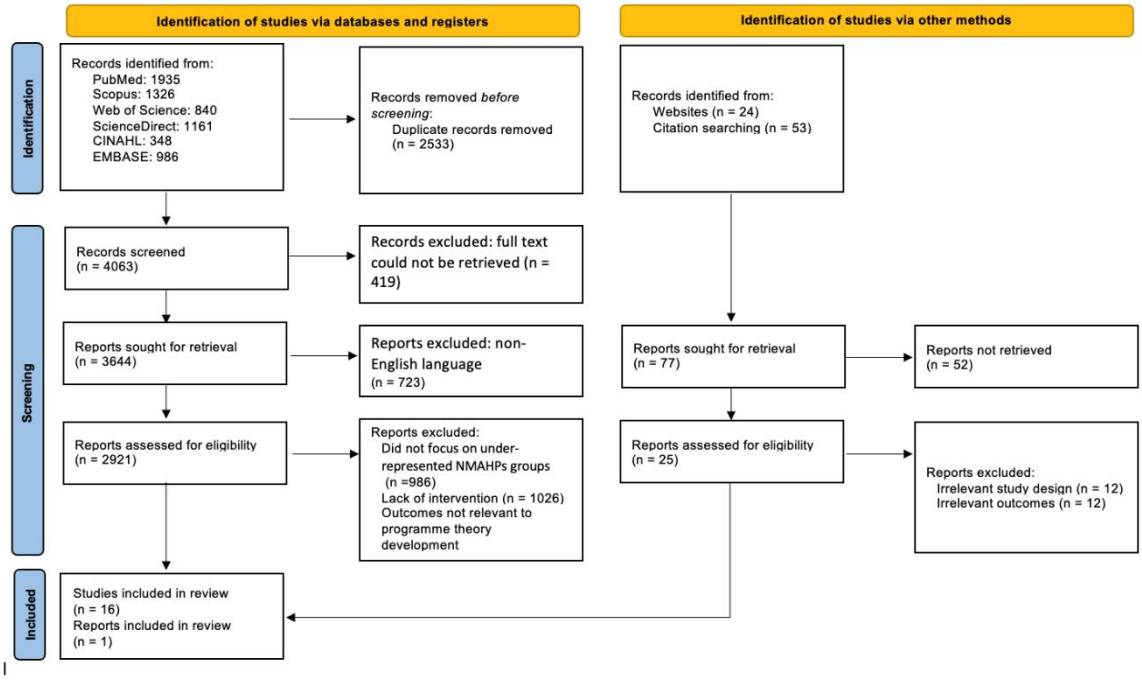


Figure 1: PRISMA flow chart

1.5 Study Characteristics:

A total of 17 studies were included in the realist synthesis, representing a diverse range of methodological approaches and clinical academic initiatives involving NMAHPs as shown in Table 2. The evidence base comprised five qualitative studies [16, 30–33], two cross-sectional survey studies [5, 34], seven mixed-methods or programme evaluation studies [9, 35–40], one organisational partnership case study [41], one development/model paper [4], and one expert commentary [42]. Collectively, the studies evaluated a broad range of interventions, including NIHR Integrated Clinical Academic (ICA) fellowships, research internships, structured career pathways, embedded researcher models, organisational research capacity-building programmes, mentoring initiatives, leadership programmes and targeted interventions supporting under-represented ethnic minority NMAHPs. Sample sizes varied considerably, ranging from 15 interview participants to 538 survey respondents, with several organisational evaluations incorporating mixed stakeholder groups including clinicians, managers, academic mentors and healthcare leaders. The majority of studies were undertaken within United Kingdom National Health Service (NHS) organisations and examined partnerships between NHS Trusts and higher education institutions, reflecting the UK policy emphasis on strengthening the NMAHP clinical academic workforce. Across the studies,

recurring contextual influences included limited research infrastructure, insufficient protected research time, fragmented career pathways, organisational barriers and workforce inequalities. Conversely, interventions consistently focused on mentoring, leadership development, research funding, protected academic time, multidisciplinary collaboration and organisational investment. Despite methodological heterogeneity, the included studies provided complementary evidence across individual, organisational and system levels, offering rich explanatory data to develop and refine context-mechanism-outcome configurations underpinning the sixteen final programme theories across four higher-order explanatory domains.

Table 2: Characteristics of the included studies

Study (Author, Year)	Study Type	Intervention Used	Context Clues (C)	Outcome Patterns (O)	Sample Size	Population Involved	Explanatory Hints (Mechanism Candidates - M)
Avery *et al.*, 2022 [5]	Cross-sectional online survey	NIHR Integrated Clinical Academic (ICA) fellowships and clinical academic career pathway	Limited research career pathways; lack of integration between NHS and academia; inadequate research positions and funding	Fellowship holders more likely to remain research active; clearer career pathways and organisational integration associated with career sustainability	231 respondents	Nurses, midwives and allied health professionals (doctoral and postdoctoral fellowship applicants)	Early exposure to research, fellowship funding, mentorship, organisational integration, career clarity and protected research opportunities increase research career progression.
Cowley *et al.*, 2020 [30]	Qualitative study (semi-structured interviews)	Early clinical academic Master's and Doctoral training	Transition from clinician to researcher; organisational uncertainty regarding clinical academic roles	Development of research identity, leadership capability and organisational influence despite implementation challenges	17 participants	Early career nurses, midwives and allied health professionals	Identity transformation, organisational recognition, collaborative partnerships and transformational leadership facilitate research career development.
Johnson *et al.*, 2021 [34]	Cross-sectional survey (secondary analysis)	No intervention (observational study examining career progression inequalities)	Ethnic minority nurses experience reduced access to training, promotion opportunities and	Delayed career progression; fewer promotions; reduced professional development	538 nurses and midwives	White and Black, Asian and Minority Ethnic (BAME)	Equal access to professional development, transparent recruitment processes, organisational fairness and managerial support may

			organisational support	opportunities		nurses and midwives	reduce progression inequalities.
King *et al.*, 2023 [31]	Qualitative interview study	Clinical academic career pathway (experiential exploration)	Competitive research environment; limited organisational support; uncertainty of clinical academic careers	Successful clinical academics demonstrate resilience, motivation, persistence and collaborative behaviours	20 participants	Aspiring and established allied health professional clinical academics	Personal motivation, resilience, networking, collaborative learning, tolerance of failure and intrinsic commitment enable persistence despite barriers.
Newington *et al.*, 2021 [32]	Qualitative interview study	Existing clinical academic roles	Research-active organisations; tensions between service delivery and research	Improved research culture, patient care, evidence-based practice and workforce retention, but role precarity remains	Research-active clinicians and managers (two stakeholder groups)	Nurses, midwives, allied health professionals, pharmacists, healthcare scientists and managers	Visibility of clinical academics, organisational recognition, supportive leadership and protected roles enhance organisational research culture and impact.
Nightingale *et al.*, 2020 [35]	Mixed-methods evaluation	NIHR Allied Health Professions and Nursing Research Internship Programme	Entry-level research capacity building; regional variation; balancing clinical duties with research;	Improved research capability, confidence and research culture; only around one-quarter progressed to next ICA stage	104 interns, 12 managers, 36 academic mentors, 10 focus group participants, 8	Nurses, allied health professionals, managers and academic mentors	Research internships, mentoring, protected research time, managerial support and institutional partnerships facilitate early research engagement.

			progression bottlenecks		interviews		
Oulton *et al.*, 2022 [36]	Organisational case study (mixed evaluation)	Multi-component organisational research capacity-building programme	Research-active hospital; organisational commitment; existing inequities across professional groups	Increased fellowship awards (>30), improved research engagement and stronger research culture, although sustainability challenges remained	Organisation-wide surveys (2015 & 2018) and focus groups	Nurses and allied health professionals within a specialist children's hospital	Strategic leadership, organisational infrastructure, local investment, research culture and leadership commitment enable sustained research capacity building.
Bramley *et al.*, 2024 [33]	Qualitative programme evaluation	Step Into Clinical Academic Careers Programme (targeted programme for ethnic minority NMAHPs)	Structural, organisational and personal barriers experienced by ethnic minority staff	Increased confidence, motivation, networking and career aspirations	Programme participants (follow-up interviews and evaluations)	Nurses, midwives and allied health professionals from ethnic minority backgrounds	Targeted mentoring, peer networking, leadership development, role models and culturally responsive support improve engagement with clinical academic careers.
Ali, 2024 [42]	Expert commentary	Commentary on the Step Into Clinical Academic Careers Programme	Underrepresentation of ethnic minority healthcare professionals within research leadership	Reinforces evidence that targeted programmes improve confidence, networking and motivation	Commentary	Nurses, midwives and allied health professionals from ethnic minority backgrounds	Representation, mentorship, leadership development and inclusive organisational cultures encourage participation in research careers.

Lutman-White *et al.*, 2025 [37]	Mixed-methods programme evaluation	iCAhRE™ facilitated research career pathway	NHS-supported research pathway; limited protected research time; lack of clinical academic posts; unsupportive managers	Increased research knowledge, confidence, career progression, research activity and higher-grade appointments; persistent organisational barriers remained	29 survey participants; 12 interviews	Nurses, midwives, allied health professionals and healthcare scientists	Structured career pathways, staged training, NHS-university partnerships, managerial support, protected research time and sustained mentoring promote long-term research career progression.
Westwood *et al.*, 2018 [41]	Organisational partnership case study	University-NHS partnership model supporting Integrated Clinical Academic (ICA) pathway, fellowships and joint clinical-academic appointments	Limited national research capacity; need to increase NMAHP clinical academics; strong strategic NHS-HEI collaboration	Increased doctoral training, leadership development, clinical academic workforce growth and sustainability	Masters (n=28), Doctoral (n=36), Clinical Lecturers (n=5), Senior Clinical Lecturers (n=2), Clinical Professors (n=3)	Nurses, midwives and allied health professionals	Strategic leadership, organisational commitment, protected pathways, joint appointments and institutional partnership increase opportunity and career progression.
Trusson *et al.*, 2019 [38]	Mixed-methods (survey + interviews)	Existing regional clinical academic pathway and	NMAHPs enter research later than doctors; limited	Benefits for patients, services and individuals despite	Survey n=67; Interviews n=16	NMAHPs pursuing clinical	Personal motivation, organisational encouragement, networking

		practitioner network	post-PhD opportunities; balancing clinical and academic roles	significant barriers		academic careers	and visible career pathways sustain progression despite barriers.
Trusson *et al.*, 2021 [9]	Multimethod comparative study	Comparison of medical and NMAHP clinical academic pathways	Structural differences between medical and NMAHP career routes; delayed research entry for NMAHPs	Similar benefits but greater structural barriers for NMAHPs	67 NMAHPs; 73 medical clinical academics; 16 interviews per group	Medical clinical academics and NMAHPs	Early exposure, integrated pathways, protected academic time and clearer career structures facilitate persistence and success.
Shepherd *et al.*, 2022 [39]	Organisational service development/evaluation	Chief Nurse Research Fellows, Embedding Research in Care (ERIC) Units, Clinical Academic Network	Low research awareness; weak research culture; limited infrastructure and mentorship	Increased research engagement, mentoring, leadership development and identification of future clinical academics	First fellowship cohort; Clinical Academic Network >25 members	Nurses, midwives and allied health professionals	Mentoring, peer support, research networks, leadership visibility and protected development time enhance confidence and engagement.
Spring *et al.*, 2023 [40]	Programme evaluation using VICTOR framework	CNMR Fellowship Programme with protected research time and backfill funding	Low NIHR fellowship success; lack of research time; insufficient organisational support	Protected time improved publications, collaborations, conference presentations and fellowship readiness	Fellowship cohort (2016-17 recipients)	Nurses, midwives and allied health professionals	Protected time, collaboration, organisational recognition and academic support increase research productivity and career readiness.

Whitehouse *et al.*, 2022 [4]	Development paper/model design	NMAHP Embedded Researcher (ER) Model	Clinical workload, limited research infrastructure, poor career continuity, need for sustained collaboration	Proposed sustainable research capacity model integrating research within clinical practice	Not applicable (model development)	Nurses, midwives and allied health professionals	Embedded researcher identity, long-term organisational investment, clinical-academic collaboration and local ownership promote sustainable research cultures.
Williams *et al.*, 2023 [16]	Qualitative interview study	No intervention (contextual evidence informing future leadership intervention)	Experiences of racism, under-representation, absent discussion of race, lack of inclusive curricula	Altered career expectations and reduced confidence among ethnic minority students	n=15	Student nurses from diverse ethnic backgrounds	Representation, psychological safety, inclusive curricula and anti-racist environments are mechanisms likely to improve aspirations and future career progression.

1.6 Relevance and Rigour Assessment:

The methodological quality of the included studies was appraised using design-specific critical appraisal tools appropriate to the heterogeneous evidence base (Supplementary Tables S1-S4). Qualitative studies (n = 5) were assessed using the Critical Appraisal Skills Programme (CASP) Qualitative Checklist, mixed-methods and programme evaluation studies (n = 7) were evaluated using the Mixed Methods Appraisal Tool (MMAT 2018), cross-sectional survey studies (n = 2) were assessed using the Joanna Briggs Institute (JBI) Analytical Cross-Sectional Checklist, and commentary, conceptual and organisational case study papers (n = 3) were appraised using the AACODS checklist. Overall, the evidence base demonstrated moderate-to-high methodological quality, although recurring limitations were identified across study designs. Qualitative studies generally satisfied CASP criteria, with clearly stated aims, appropriate methodologies, rigorous analyses and well-supported findings; however, most provided limited reporting of researcher reflexivity or consideration of researcher-participant relationships, resulting in several domains being judged as "Can't Tell" rather than indicating a high risk of bias (Supplementary Table S1).

Cross-sectional studies met most JBI criteria, including clearly defined inclusion criteria, valid outcome measurement and appropriate statistical analyses, although identification and management of potential confounding factors were inconsistently reported, leading to moderate overall ratings (Supplementary Table S2). Mixed-methods studies performed well against MMAT criteria, demonstrating appropriate integration of qualitative and quantitative components and conclusions supported by integrated findings. Nevertheless, several evaluations provided limited discussion of inconsistencies between data sources or the rationale for integrating mixed-methods findings, resulting in partial ratings for these domains (Supplementary Table S3). One programme evaluation [40] did not include a distinct qualitative component and was therefore appraised against the applicable quantitative MMAT domains only, with the remaining domains recorded as not applicable.

Finally, commentary, conceptual and organisational case study papers fulfilled most AACODS criteria for authority, currency, coverage and significance; the commentary and conceptual contributions, by nature, lacked empirical methodology and were therefore considered valuable conceptual contributions rather than primary empirical evidence, while the organisational case study provided descriptive evidence from a single institutional context (Supplementary Table S4). No studies were excluded on the basis of methodological quality; instead, appraisal findings informed the interpretation and weighting of evidence during

realist synthesis, consistent with RAMESES guidance, whereby explanatory relevance and methodological rigour were considered alongside each study's contribution to programme theory refinement.

1.7 Programme Theory Development:

The initial programme theory (IPT) was developed through an iterative synthesis of evidence extracted from the included studies, identifying recurrent Context-Mechanism-Outcome (CMO) configurations that explained how interventions facilitate equitable clinical academic career progression among under-represented NMAHPs (Supplementary Table S5). Across the included evidence, recurring contextual influences included limited research opportunities, poorly defined clinical academic pathways, organisational barriers, inequitable funding systems, under-representation in leadership, and competing clinical demands. These contexts activated a range of psychological, organisational and social mechanisms, including the development of research identity, self-efficacy, belonging, relational trust developed through mentoring, leadership confidence, social capital, procedural fairness and organisational legitimacy, which collectively influenced progression into clinical academic careers. The preliminary IPT was progressively refined through constant comparison of evidence, abductive reasoning and retroductive analysis, resulting in 42 refined CMO configurations that were consolidated into 16 interrelated Programme Theories (PTs). These Programme Theories were subsequently organised into four higher-order explanatory domains presented in Table 3, encompassing mechanisms and contextual conditions relating to early research exposure, structured career pathways, mentorship, networking, funding navigation, organisational infrastructure, inclusive leadership, protected research time, equitable systems and embedded clinical academic roles. Across these domains, the findings suggest that sustained clinical academic progression depends on the interaction between interventions that strengthen individual research capability, including confidence, identity and perceived opportunity, as well as organisational capacity that enables these capabilities to be enacted and sustained.

Table 3: Programme Theories and CMO Configurations

Programme Theories		**Context (C)**	**Mechanism (Resource → Reasoning)**	**Outcome (O)**	**Supporting studies**
PT1. Early research internships increase perceived attainability of clinical academic careers among under-represented NMAHPs, but convert interest into progression only where follow-on routes exist	CMO1	Under-represented NMAHPs have limited awareness of clinical academic careers and few opportunities to experience research early in their careers.	Resource: Structured internships provide authentic research experience, supervision and protected learning opportunities. Reasoning: Clinicians begin to perceive research careers as legitimate, attainable and compatible with their professional identity.	Increased interest in clinical academic careers and applications for further research training.	Nightingale; Avery; Trusson (2021); Ali
	CMO2	Internships embed research within clinicians' own clinical environment and focus on practice-based problems.	Resource: Clinicians investigate real clinical questions alongside experienced researchers. Reasoning: Research is reinterpreted as relevant to improving patient care rather than as an activity reserved for academics.	Stronger clinician-researcher identity and sustained research engagement.	Avery; King; Shepherd; Trusson (2019)
	CMO3	Internship programmes lack clear progression routes, organisational support or follow-on opportunities.	Resource absent: Limited progression pathways and weak post-internship support. Reasoning: Clinicians perceive research careers as uncertain and difficult	Reduced progression into fellowships and loss of research-trained clinicians.	Nightingale; Avery; Trusson (2021); Lutman-White

			to sustain despite positive internship experiences.		
PT2. Bridging programmes (e.g., Master's-to-doctorate pathways) reduce transition uncertainty and strengthen clinician-researcher identity, gains that dissipate where doctoral opportunities and senior posts are scarce	CMO4	Under-represented NMAHPs transition from predominantly clinical roles into postgraduate research with limited previous academic experience.	Resource: Structured Master's and doctoral training provide multidisciplinary learning, supervision and protected academic development. Reasoning: Clinicians reinterpret themselves as capable of contributing to research rather than solely delivering clinical care.	Development of clinician-researcher identity and continued academic progression.	Cowley; Trusson (2021); Lutman-White
	CMO5	Bridging programmes maintain participants' clinical practice while developing research capability.	Resource: Simultaneous engagement in clinical and academic work. Reasoning: Clinicians perceive research as complementary to, rather than competing with, their clinical identity and professional purpose.	Stronger commitment to long-term clinical academic careers and evidence-based practice.	Cowley; Whitehouse; Trusson (2019)
	CMO6	Progression beyond Master's programmes is constrained by limited doctoral opportunities, scarce senior posts and organisational support.	Resource absent: Weak organisational pathways and few advanced research positions. Reasoning: Clinicians perceive limited return from continued academic development and question the feasibility of progressing further.	Attrition following postgraduate training and reduced progression into doctoral and senior clinical academic	Trusson (2019); Lutman-White; Avery

				roles.	
PT3. Clinical academic fellowships legitimise research participation and create sustainable entry into research careers only where post-award posts and organisational commitment continue	CMO7	Under-represented NMAHPs encounter financial barriers, limited protected time and uncertainty about entering research careers.	Resource: Fellowships provide salary support, protected research time, formal research training and institutional recognition. Reasoning: Clinicians perceive research participation as organisationally legitimate and personally feasible without compromising their clinical responsibilities.	Successful transition into research careers, increased research productivity and fellowship completion.	Avery; Spring; Nightingale; Shepherd
	CMO8	Fellowships combine structured supervision, mentoring and research training.	Resource: Access to experienced supervisors and structured research development. Reasoning: Participants perceive themselves as legitimate members of the clinical academic community with realistic prospects for progression.	Greater research self-efficacy, successful funding applications and continued research engagement.	Avery; Bramley; Lutman-White; Spring
	CMO9	Fellowships end without post-award support, dedicated research posts or organisational commitment.	Resource absent: Limited career continuity following fellowship completion. Reasoning: Clinicians perceive research careers as insecure despite successful fellowship experiences.	Reduced retention and discontinuation of clinical academic careers.	Avery; Lutman-White; Trusson (2021); Newington
PT4. Structured	CMO10	Under-represented	Resource: Experienced mentors provide	Increased	Avery; Bramley;

mentorship enables under-represented NMAHPs to navigate hidden academic systems and progress into research careers		NMAHPs enter research with limited knowledge of funding pathways, career structures and academic expectations.	sponsorship, practical advice and tacit knowledge about academic careers. Reasoning: Clinicians perceive research careers as understandable and navigable rather than inaccessible or reserved for others.	applications for fellowships, postgraduate training and clinical academic posts.	Lutman-White; Nightingale
	CMO11	Mentoring relationships provide ongoing support beyond formal training programmes.	Resource: Long-term mentoring offers career guidance, advocacy and constructive feedback. Reasoning: Participants perceive themselves as legitimate members of the clinical academic community who are supported to progress despite challenges.	Greater career persistence, successful progression through successive research stages and leadership development.	Bramley; Avery; Lutman-White; Spring
	CMO12	Mentoring is absent, inconsistent or culturally insensitive to the experiences of under-represented clinicians.	Resource absent: Limited sponsorship and guidance. Reasoning: Structural barriers remain interpreted as personal limitations and academic careers continue to appear inaccessible.	Reduced applications, slower progression and higher attrition from research careers.	Ali; Johnson; Williams; Bramley

PT5. Visible and representative role models reshape beliefs about who can succeed in clinical academia	CMO13	Under-represented NMAHPs rarely encounter senior clinical academics from similar professional or ethnic backgrounds.	Resource: Exposure to visible and representative clinical academic role models. Reasoning: Clinicians reinterpret who can legitimately belong within academic careers and perceive research careers as personally attainable.	Increased aspirations to pursue research, fellowships and leadership positions.	Ali; Avery; Williams; Bramley
	CMO14	Senior clinical academic role models remain scarce or invisible within organisations.	Resource absent: Limited representation. Reasoning: Research careers continue to be viewed as exclusive or unattainable for under-represented clinicians.	Reduced aspirations, lower participation in research programmes and slower progression into leadership roles.	Avery; Williams; Ali
PT6. Leadership development programmes cultivate research leadership identity and progression into senior clinical academic roles	CMO15	Under-represented NMAHPs have limited opportunities to develop leadership capabilities alongside research training.	Resource: Leadership programmes provide structured reflection, coaching and leadership education. Reasoning: Participants reinterpret themselves as capable of influencing research, services and organisational change rather than solely delivering clinical care.	Greater participation in research leadership and progression into senior clinical academic roles.	Bramley; Westwood; Ali
	CMO16	Organisations provide	Resource absent: Limited organisational	Reduced translation	Bramley;

		leadership training without recognising or supporting leadership roles after programme completion.	opportunities for leadership enactment. Reasoning: Participants perceive few opportunities to apply newly developed leadership capabilities.	of leadership learning into sustained career progression.	Cowley; Westwood
PT7. Networking initiatives and communities of practice generate social capital that facilitates equitable career progression	CMO17	Under-represented NMAHPs have limited access to established academic networks and influential collaborations.	Resource: Networking initiatives connect clinicians with experienced researchers, collaborators and multidisciplinary communities. Reasoning: Participants perceive themselves as belonging within the research community and gain access to opportunities previously unavailable through informal organisational networks.	Increased collaborations, fellowship applications and research career progression.	Bramley; Shepherd; Spring; Ali
	CMO18	Networking opportunities are limited or participation depends upon existing organisational privilege.	Resource absent: Restricted access to collaborative networks. Reasoning: Under-represented clinicians continue to perceive themselves as peripheral to academic communities and lack access to influential relationships.	Persistent inequities in collaboration, funding opportunities and career progression.	Ali; Johnson; Williams; Bramley
PT8. Funding application support improves navigation of competitive	CMO19	Under-represented NMAHPs have limited experience of competitive	Resource: Structured grant-writing workshops, application guidance and mentor feedback make funding processes	Increased fellowship applications and improved funding	Spring; Avery; Bramley; Oulton

research funding systems		funding processes and hidden expectations for successful applications.	explicit. Reasoning: Applicants perceive funding systems as understandable and believe they possess the capability to prepare competitive applications.	success.	
	CMO20	Experienced mentors and previous award holders provide tailored advice throughout the application process.	Resource: Individualised coaching and practical feedback on proposals. Reasoning: Applicants perceive that competitive funding is achievable despite previous uncertainty or under-representation.	Higher-quality applications, increased confidence to reapply and greater progression into research careers.	Avery; Lutman-White; Bramley; King
	CMO21	Funding support is unavailable or generic, particularly for clinicians experiencing structural disadvantage.	Resource absent: Limited guidance on navigating funding systems. Reasoning: Applicants continue to perceive funding as inaccessible and excessively competitive.	Reduced application rates, repeated unsuccessful applications and lower participation by under-represented NMAHPs.	Johnson; Ali; Spring
PT9. Transparent funding assessment processes increase perceptions of procedural fairness and	CMO22	Under-represented clinicians perceive research funding decisions as opaque and influenced by existing	Resource: Transparent assessment criteria, equitable review procedures and constructive feedback. Reasoning: Applicants perceive funding decisions as	Continued engagement with funding opportunities and	Johnson; Ali; Williams

encourage continued engagement with research funding		inequalities.	procedurally fair and believe future applications will be judged equitably.	increased reapplication following unsuccessful bids.	
	CMO23	Funding organisations adopt inclusive assessment criteria recognising diverse research and clinical contributions.	Resource: Broader definitions of research excellence and transparent decision-making. Reasoning: Applicants perceive that their clinical experience and diverse career pathways are recognised as legitimate forms of academic achievement.	Greater equity in funding success and improved representation within clinical academic careers.	Ali; Williams; Johnson
	CMO24	Funding decisions lack transparency or meaningful feedback.	Resource absent: Opaque review processes and limited reviewer feedback. Reasoning: Applicants attribute unsuccessful outcomes to structural bias rather than improvable aspects of their applications.	Reduced willingness to reapply and diminished progression through funding pathways.	Johnson; Williams; Ali
PT10. Post-award mentoring and organisational support sustain research careers beyond initial funding success	CMO25	Clinicians successfully complete fellowships but face uncertain career opportunities afterwards.	Resource: Continued mentoring, career planning and organisational support beyond award completion. Reasoning: Award holders perceive long-term research careers as achievable rather than temporary opportunities.	Sustained research engagement, retention and progression to independent research roles.	Nightingale; Lutman-White; Avery

	CMO26	Organisations provide structured post-award opportunities, research posts and continuing academic development.	Resource: Protected research roles and clear progression routes. Reasoning: Clinicians perceive continued organisational commitment to their research careers and remain invested in clinical academia.	Transition into senior research roles and increased organisational research capacity.	Lutman-White; Westwood; Whitehouse
	CMO27	Fellowship recipients return to organisations lacking research infrastructure or career opportunities.	Resource absent: No dedicated research posts or organisational continuity. Reasoning: Clinicians perceive limited opportunities to apply newly acquired research expertise.	Attrition from clinical academic careers and loss of research capacity.	Avery; Newington; Trusson (2021)
PT11. Protected research time and workforce backfill legitimise research participation alongside clinical practice; without backfill, individual motivation cannot offset clinical workload	CMO28	Clinical workloads compete directly with opportunities to undertake research.	Resource: Protected research time and workforce backfill reduce competing clinical demands. Reasoning: Clinicians perceive research as an accepted and legitimate component of their professional role rather than an additional personal burden.	Increased research productivity, fellowship completion and research participation.	Spring; Nightingale; Whitehouse; Avery
	CMO29	Protected time is unavailable or clinical posts are not backfilled.	Resource absent: Persistent workforce pressures and service demands. Reasoning: Research is perceived as incompatible with	Reduced research participation, slower progression and	Spring; Whitehouse; Oulton; Lutman-

			clinical responsibilities despite individual motivation.	higher attrition.	White
PT12. Structured clinical academic career pathways reduce uncertainty and support progression across successive career stages	CMO30	Under-represented NMAHPs encounter fragmented research opportunities and poorly defined career pathways compared with medical colleagues.	Resource: Clearly structured pathways linking internships, Master's programmes, fellowships and senior clinical academic roles. Reasoning: Clinicians perceive research careers as coherent, achievable and worthy of long-term investment.	Increased retention and progression across successive clinical academic stages.	Avery; Lutman-White; Trusson (2021)
	CMO31	Career pathways provide staged mentoring, leadership development and tailored support according to career stage.	Resource: Progressive and integrated career development. Reasoning: Clinicians perceive that they can continue developing within research without repeatedly negotiating disconnected opportunities.	Sustained progression into senior research leadership and improved workforce capacity.	Lutman-White; Westwood; Cowley
	CMO32	Organisations provide isolated research opportunities without long-term pathway planning.	Resource absent: Fragmented programmes and limited senior research posts. Reasoning: Clinicians perceive research careers as unstable with few realistic opportunities for advancement.	Career bottlenecks, workforce attrition and underdeveloped clinical academic capacity.	Trusson (2019); Avery; Newington; Lutman-White

PT13. Inclusive organisational leadership and NHS-HEI partnerships create environments where research careers become institutionally legitimate and sustainable	CMO33	NHS organisations and universities establish formal partnerships with shared governance, leadership and research infrastructure.	Resource: Joint appointments, coordinated governance, shared funding and integrated research infrastructure. Reasoning: Clinicians perceive research careers as organisationally valued, stable and achievable rather than peripheral to clinical practice.	Increased participation in clinical academic pathways and sustainable workforce development.	Westwood; Whitehouse; Cowley; Oulton; Nightingale
	CMO34	Organisational partnerships are fragmented, leadership commitment is inconsistent or research infrastructure is poorly implemented.	Resource absent: Weak organisational coordination and limited institutional support. Reasoning: Clinicians perceive research careers as unstable, unsupported and dependent upon individual effort rather than organisational commitment.	Reduced research participation, fragmented career progression and loss of research capacity.	Cowley; Avery; Newington; Trusson (2021)
PT14. Equity-focused interventions reduce structural barriers by fostering psychological safety, belonging and perceptions of fairness for under-represented	CMO35	Under-represented NMAHPs experience structural inequities, racism and under-representation within research and leadership.	Resource: Targeted mentoring, inclusive leadership programmes and culturally responsive organisational support. Reasoning: Clinicians perceive that organisational barriers are recognised and that they legitimately belong within research and leadership communities.	Increased participation in research programmes, funding applications and leadership pathways.	Ali; Bramley; Williams; Johnson

NMAHPs	CMO36	Recruitment, promotion and funding processes are transparent and explicitly designed to promote equity.	Resource: Transparent decision-making, equitable assessment and inclusive organisational policies. Reasoning: Participants perceive organisational processes as procedurally fair and believe progression depends upon capability rather than structural advantage.	Greater retention, equitable progression and increased leadership representation among under-represented NMAHPs.	Johnson; Ali; Williams
	CMO37	Organisations fail to address discrimination, under-representation or structural inequities.	Resource absent: Limited representation, weak organisational accountability and persistent discrimination. Reasoning: Clinicians continue to anticipate exclusion and perceive research careers as inaccessible regardless of personal ability.	Lower participation, reduced retention and persistent inequities in clinical academic progression.	Williams; Johnson; Ali; Cowley
PT15. Recognition and visibility of research achievements reinforce research identity and organisational commitment to clinical academic careers;	CMO38	Organisations actively celebrate research achievements through dissemination, awards and visible research leadership.	Resource: Public recognition of research contributions and organisational celebration of success. Reasoning: Clinicians perceive research as professionally valued and believe research activity contributes meaningfully to career progression and organisational priorities.	Stronger research identity, increased engagement with research opportunities and organisational research culture.	Spring; Oulton; Newington; Shepherd

invisibility of research achievement signals that research carries little career value	CMO39	Research achievements remain invisible or are undervalued within healthcare organisations.	Resource absent: Limited organisational recognition and poor dissemination of research success. Reasoning: Clinicians perceive research as offering limited professional value or organisational support.	Reduced motivation to pursue research careers and weaker organisational research culture.	Spring; Oulton; Newington
PT16. Embedded clinical academic roles translate research into practice while reinforcing the value and sustainability of clinical academic careers	CMO40	Clinical academics remain embedded within clinical services while undertaking research.	Resource: Continuous interaction between research activity and routine clinical practice. Reasoning: Clinicians perceive research as directly relevant to improving patient care and maintaining their clinical identity rather than representing an alternative career pathway.	Improved evidence-based practice, sustained clinician-researcher identity and greater research retention.	Whitehouse; Cowley; Nightingale; Trusson (2019)
	CMO41	Organisations establish long-term embedded research roles supported by executive leadership and protected resources.	Resource: Permanent embedded research positions and organisational investment. Reasoning: Clinicians perceive research careers as sustainable and capable of influencing organisational decision-making and service improvement.	Stronger organisational research capacity, knowledge mobilisation and healthcare innovation.	Whitehouse; Newington; Shepherd; Westwood
	CMO42	Embedded clinical academic	Resource absent: Role ambiguity, insecure	Reduced knowledge	Newington;

		roles are poorly understood, temporary or unsupported by organisational infrastructure.	employment and competing clinical pressures. Reasoning: Clinicians perceive research roles as peripheral and difficult to sustain alongside clinical responsibilities.	mobilisation, weaker organisational impact and loss of experienced clinical academics.	Whitehouse; Trusson (2021); Cowley

What interventions initiate clinical academic careers?

The first higher order theory suggests that the interventions supporting entry into clinical academic careers function by changing how under-represented nurses, midwives and allied health professionals (NMAHPs) perceived the attainability, legitimacy and value of research careers. Structured research internships provided authentic research experiences, supervision and protected learning opportunities for clinicians with limited awareness of clinical academic pathways (CMO1), enabling participants to view research as an achievable extension of their professional role and increasing interest in further research training. Where internships were embedded within clinical settings and addressed problems relevant to practice (CMO2), research was more readily perceived as compatible with clinical identity and capable of contributing to patient care, strengthening clinical-researcher identity and continued engagement. However, where clear progression routes, organisational support or follow-on opportunities were absent (CMO3), increased research capability was not matched by credible opportunities for progression, generating uncertainty about career viability and contributing to attrition. The intervention types mirror those reported for doctors and dentists [19]; the difference lies in the platform beneath them. For doctors, these interventions operate on top of an integrated training pathway, whereas for NMAHPs they must often substitute for one, which is why organisational capacity emerges in this synthesis as the decisive condition. Early-career reform proposals now make a similar argument across the clinical academic pipeline [43].

Similar mechanisms were evident within Master's-to-doctorate bridging programmes, where structured postgraduate training, multidisciplinary supervision and continued clinical practice strengthened perceived capability and supported the development of clinical-researcher identity (CMO4-CMO5). These gains were less likely to translate into sustained progression where doctoral opportunities and organisational pathways were limited (CMO6). Clinical academic fellowships similarly provided protected research time, salary support, supervision and formal research training that reduced financial and organisational barriers while legitimising research as part of clinicians' professional roles (CMO7-CMO8). Where post-award support and substantive research roles were unavailable (CMO9), however, clinicians could develop research capability without the organisational capacity required to sustain it, contributing to perceptions of career insecurity and reduced retention. Across these interventions, entry into clinical academic careers therefore depended on more than exposure to research opportunities, with sustained progression shaped by whether increased capability

and research identity were accompanied by credible pathways through which they could be enacted.

How do interventions support progression and retention?

The second higher-order programme theory suggests that developmental interventions support progression and retention by reducing uncertainty, strengthening professional legitimacy and expanding the social capital available to under-represented NMAHPs. Structured mentoring was particularly important for clinicians with limited knowledge of academic career pathways, funding processes and institutional expectations (CMO10), as access to sponsorship, practical guidance and tacit knowledge increased understanding of how clinical academic careers could navigated and supported applications for fellowships, postgraduate training and research posts. Where mentoring extended beyond time-limited programmes to provide continuing advocacy, constructive feedback and career guidance (CMO11), participants developed a stronger sense of belonging within the clinical academic communities and greater continuity across successive career stages. Conversely, inconsistent or insufficient culturally responsive mentoring (CMO12) could leave structural barriers less visible and clinicians with fewer resources through which to interpret and navigate unsuccessful applications or stalled progression, potentially reducing subsequent participation and retention.

Related mechanisms operated through representation, leadership development and access to professional networks. Exposure to successful clinical academics from comparable professional or ethnic backgrounds (CMO13) strengthened perceived legitimacy and attainability by challenging assumptions about who could succeed within academia, whereas where limited representation (CMO14) could reinforce perceptions that research careers were inaccessible. Leadership programmes provided progression by coaching and reflective learning through which participants developed confidence and research leadership identity (CMO15), although these gains were difficult to sustain where organisations provided limited opportunities to enact newly acquired capabilities (CMO16). Networking initiatives and multidisciplinary communities of practice similarly expanded access to collaboration, tacit knowledge and research opportunities (CMO17), while restricted access to influential networks could perpetuate inequalities in collaboration, funding and progression (CMO18). Across these interventions, progression and retention were therefore shaped by whether clinicians gained continuing access to relationships, representation and networks that

strengthen belonging, legitimacy and opportunity, and whether organisational contexts provided opportunities through which these resources could be converted into sustained career advancement.

Under what organisational circumstances do interventions succeed or fail?

The third higher-order programme theory suggests that equitable progression through clinical academic careers depends on how organisational and funding systems shape clinicians' ability to access, sustain and advance within research careers. Funding application support was particularly important for under-represented NMAHPs with limited experience of competitive research funding (CMO19), as grant-writing workshops, mentor feedback and tailored guidance increased understanding of funding process and confidence in developing competitive applications. Continued coaching from experienced award holders supported persistence following unsuccessful applications (CMO20), whereas limited or generic support could reinforce perceptions that funding systems were difficult to navigate and reduce subsequent participation (CMO21). Within funding assessment processes, transparent criteria, constructive feedback and recognition of diverse clinical contributions (CMO22-CMO23) strengthen perceptions of procedural fairness and encouraged continued engagement, while opaque assessment processes and limited feedback (CMO24) could discourage reapplication and constrain progression.

Progression beyond initial funding success depended increasingly on organisational conditions, with continued mentoring, protected research roles and career planning supporting perceptions that clinical academic careers were viable and sustainable (CMO25-CMO27). Protected research time, workforce backfill and structured clinical academic pathways (CMO28-CMO32) provided clinicians with organisational capacity to enact developing research capabilities alongside clinical responsibilities, while also legitimising research as part of professional practice rather than an activity undertaken in addition to it. Formal NHS-higher education institution partnerships characterised by shared governance, coordinated leadership and integrated research infrastructure (CMO33) further supported continuity across clinical and academic settings, whereas fragmented partnerships and inconsistent leadership (CMO34) generated uncertainty and disrupted progression. Across this domain, organisational and funding systems therefore shaped progression through both procedural and structural pathways, with transparent and navigable funding processes influencing access to opportunity, while protected time, substantive roles, backfill and

integrated infrastructure influenced whether research capability could be sustained and translated into longer-term clinical academic progression.

For whom do interventions work, and why do they improve healthcare?

The fourth higher-order programme theory suggests that the effects of clinical academic interventions depend on whether organisational environments address structural inequities while creating conditions in which research capability can be sustained and connected to clinical practice. Under-represented NMAHPs encountered racism, limited representation and restricted access to leadership opportunities (CMO35), while targeted mentoring, inclusive leadership and culturally responsive organisational support provided resources that could strengthen psychological safety, belonging and recognition. These mechanisms supported perceptions of legitimacy within research and leadership communities and were associated with greater participation in research programmes, funding applications and leadership pathways. Transparent recruitment, promotion and funding processes supported by equitable organisational policies (CMO36) similarly strengthened perceptions of procedural fairness, whereas unaddressed discrimination and under-representation (CMO37) could reinforce expectations of exclusion and contribute to reduced participation and retention.

Organisational recognition of research achievements through visible leadership and dissemination (CMO38) further strengthened research identity by signalling that research was valued within clinical practice, while limited recognition (CMO39) could weaken motivation and engagement. Embedding clinical academics within frontline services provided a further mechanism for connecting research and practice (CMO40), enabling clinicians to maintain their clinical identity while applying research knowledge within service settings. Where embedded roles were sustained through executive leadership, protected time and organisational resources (CMO41), studies reported stronger knowledge mobilisation, research capacity and service innovation, whereas temporary or poorly supported roles (CMO42) were associated with role ambiguity, weaker knowledge translation and reduced career sustainability. Across this domain, equitable and sustained progression therefore depended on whether clinicians experienced belonging, recognition and procedural fairness alongside organisational opportunities to enact their research capability, while the proposed pathway from embedded clinical academic roles to improved patient care remained indirect and was primarily reflected through reported changes in evidence-based practice, knowledge mobilisation and service innovation rather than directly measured patient outcomes.

Cross-cutting explanatory pathways across programme theories

Figure 2 synthesises the programme theories into four higher-order explanatory domains, illustrating how intervention resources interact with contextual conditions to activate mechanisms associated with clinical academic progression. Across the included studies, career-entry interventions, including research internships, Master's and doctoral bridging programmes and clinical academic fellowships, appeared particularly valuable where NMAHPs had limited previous exposure to research, restricted awareness of clinical academic careers or financial and organisational barriers to participation. Experiential learning, protected opportunities and structured support could increase perceived attainability, professional legitimacy and clinician-researcher identity, supporting entry into research pathways and subsequent progression. Career-progression interventions, including mentoring, representative role models, leadership development and networking, operated through related mechanisms of belonging, legitimacy, social capital and reduced uncertainty, although their effects depended on whether clinicians subsequently had opportunities through which these developing capabilities could be enacted.

Across the funding and organisational enablement domain, grant-writing support, transparent funding processes, protected research time and structured career pathways appeared to strengthen clinicians' ability to navigate funding and career systems, while the availability of post-award opportunities influenced whether capability could be converted into sustained progression. Equity, sustainability and impact extended this explanation by showing how NHS-HEI partnerships, inclusive mentoring and leadership, recognition of research activity and embedded clinical academic roles could provide organisational legitimacy, psychological safety and access to opportunities, although direct evidence for some equity-related mechanisms was more limited. Across the four domains, a common explanatory pathway therefore emerges in which interventions can develop individual capability, identity and perceived opportunity, while sustained progression depends on organisational capacity, career continuity and equitable access to opportunities through which these gains can be enacted. Figure 2 consequently provides an integrated explanation of what may work, for whom and under what circumstances, while showing how individual, organisational and system conditions interact across the clinical academic trajectory.

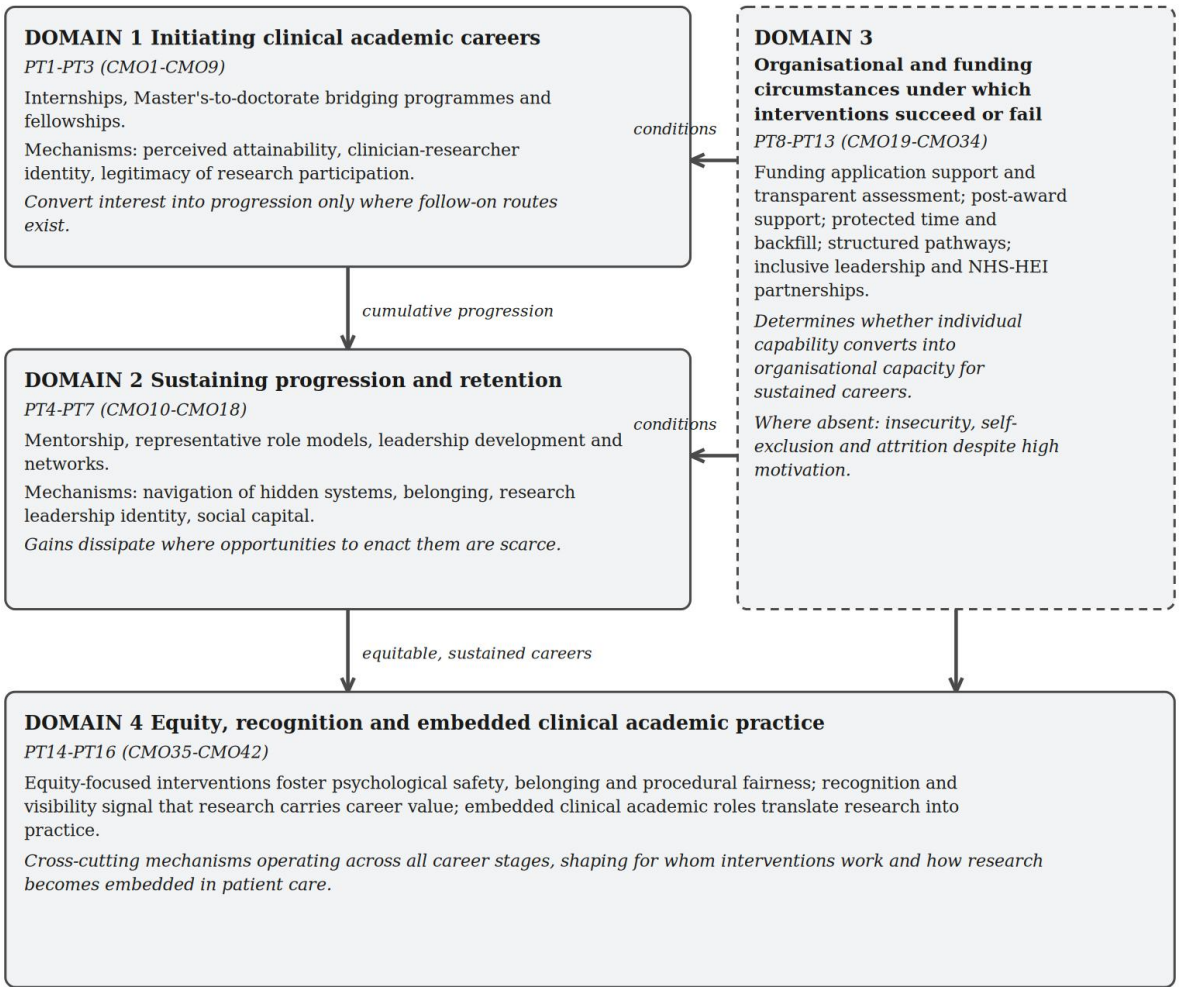


Figure 2: Cross-cutting explanatory pathways across PTs

Discussion:

This realist synthesis identifies a fundamental tension in NMAHP clinical academic development as interventions may strengthen research capability and professional identity without creating the organisational capacity necessary for sustained progression. The findings therefore shift attention from whether individual interventions work towards the conditions required for their effects to accumulate across career stages. Equitable clinical academic careers depend on alignment between individual capability, organisational capacity and wider funding and career systems.

A useful distinction emerging from these findings is between research capability and research capacity. Training, internships and fellowships may develop clinicians' knowledge, confidence and research skills, but capacity depends on whether organisations provide the

time, infrastructure, roles and opportunities through which those capabilities can be exercised. Bífárìn [44] similarly argues that capability can remain underused when protected time is eroded by clinical demands or research opportunities remain disconnected from routine service structures, conceptualising people, pathways, partnerships and platforms as mutually reinforcing elements linked by culture and leadership. Viewed through the present programme theories, these elements represent organisational resources that can enable mechanisms such as research identity, organisational legitimacy, social capital and perceived opportunity. Their alignment may therefore be critical, as developing people without corresponding pathways may build capability without enabling progression, while pathways without protected roles and infrastructure may fail to activate the mechanism needed for sustained engagement.

Beyond confirming what practitioners already recognise, four findings of this synthesis run counter to prevailing assumptions. First, a critical constraint appears downstream of where development investment is concentrated. Entry-level opportunities, including internships, Master's programmes and fellowships, can build research capacity and aspiration, yet progression may stall at the post-Master's and post-award stages where dedicated roles and protected opportunities are scarce (CMO6, CMO9, CMO25-CMO27). This capability-capacity gap may help explain why inequities persist despite established national infrastructure i.e., access to national scheme does not necessarily translate into sustained progression where local organisational pathways and capacity are limited [36, 38]. Second, partially resourced interventions may produce unintended consequences: an internship without a subsequent pathway, a fellowship without a post-award role, or leadership development without opportunities for enactment may strengthen aspirations while simultaneously exposing the insecurity of the available career pathway (CMO3, CMO9, CMO16, CMO29). The resulting mismatch between increased capability and limited opportunity provides a plausible mechanism for subsequent disengagement or attrition. Third, the synthesis suggests a potential misattribution mechanism through which structural disadvantage may be experienced as individual limitation. Where culturally responsive mentoring, sponsorship and transparent feedback are absent, clinicians may have fewer opportunities to interpret unsuccessful applications or stalled progression within their wider organisational context (CMO12, CMO21, CMO24). Reduced confidence and perceived attainability may then contribute to non-application or withdrawal. This explanation remains provisional, however, because relatively few included studies directly examined these

mechanisms among Global Majority or ethnic minority NMAHPs. Fourth, the equity findings suggest that the active ingredients of inclusive career development may be procedural as well as relational (PT9, PT14). Mentoring and leadership programmes can strengthen belonging, confidence and social capital, but these mechanisms operate within recruitment, funding and promotion systems that clinicians must perceive as accessible and fair. Equity initiatives layered onto opaque processes may therefore have limited effects because the surrounding context weakens trust in the opportunities being offered. However, the relatively small equity-specific evidence base means that this proposition should be treated as a programme theory requiring further empirical testing rather than a causal explanation.

Progression into clinical academic careers among under-represented nurses, midwives and allied health professionals (NMAHPs) is driven by cumulative interactions between individual, organisational and system-level interventions rather than by isolated educational programmes, a pattern exemplified most clearly in national evaluations of the clinical academic fellowship pathway [5]. These findings support broader evidence that sustainable clinical academic careers require integrated career pathways extending from early exposure to senior leadership rather than fragmented research initiatives [6]. Furthermore, the mechanisms identified align with Social Cognitive Career Theory, whereby mastery experiences, environmental supports and positive outcome expectations interact to influence career decision-making and persistence [45].

A key contribution of this review is demonstrating how organisational context shapes whether these interventions translate into sustained career progression. Protected research time, executive leadership, NHS-HEI partnerships and dedicated research infrastructure can legitimise research participation and create opportunities for research capability to be enacted [8, 46].These organisational conditions should, however, be understood within the service contexts in which NMAHP research careers develop. Workforce shortages, service pressures and competing clinical priorities can make protected research time difficult to sustain even where research is valued, with particular implications for mental health and community services where research capacity and infrastructure have historically been less developed than in acute hospital settings [44]. From a realist perspective, these conditions may constrain mechanisms such as perceived opportunity, organisational legitimacy and research identity, highlighting the importance of workforce planning, backfill, protected roles and investment in research infrastructure.

The synthesis also provides potential explanations for how equity-focused interventions operate, strengthening belonging, perceived fairness and legitimacy, thereby supporting under-represented clinicians to perceive research careers as attainable. This interpretation is consistent with wider evidence on institutional inclusion within academic careers [47], although the limited number of studies directly centred on ethnic minority or Global Majority NMAHPs means these mechanisms require further empirical testing. Equitable progression therefore depends on organisational conditions that connect individual capability with inclusive pathways and sustained opportunities. This extends to how different forms of research and clinical expertise are connected, with McKenna et al. [48] arguing for complementary doctoral expertise and flexible clinical academic models that strengthen research-practice translation. Rather than increasing research-trained NMAHPs alone, the findings therefore point towards a research ecosystem in which equitable career pathways, embedded clinical academic roles and complementary expertise enable knowledge generation to remain connected to clinical practice.

Several rival explanations were considered when refining these programme theories, with selection representing an important alternative explanation because clinicians who obtain internships and fellowships may already possess stronger research identity, motivation and social capital, meaning that observed outcomes could partly reflect who enters these interventions rather than what the interventions subsequently enable. Selection alone, however, does not adequately account for the patterns identified across the synthesis, as participants described changes in confidence, identity and perceived attainability following participation, while negative configurations indicated that motivated clinicians could still encounter barriers to progression where organisational resources were absent (CMO3, CMO9, CMO29). Wider evidence provides further support for considering career structures alongside individual characteristics, with Trusson et al. [9] identifying differences between medical and NMAHP clinical academic trajectories, including the greater availability of established integrated pathways for medical trainees and the tendency for NMAHPs to pursue research after establishing their clinical careers. Similarly, Avery et al. [5] found that 74.3% of NMAHP respondents pursuing clinical academic careers identified clearer career pathways and greater integration between clinical and academic departments as factors that would facilitate progression, suggesting that access to fellowships may have limited longer-term effects when corresponding employment structures remain underdeveloped. International evidence provides a further point of comparison, as Kaunda et al. [49] identified joint clinical

academic appointments and clinical professorships across healthcare systems, including the United States, while also highlighting limited evidence concerning their sustainability and wider implementation. Viewed alongside the programme theories developed in this synthesis, these comparisons suggest that research motivation and capability are enacted within institutional arrangements that shape whether clinicians can convert research development into sustained career progression, making it difficult to attribute subsequent outcomes to individual characteristics alone. A further rival explanation concerns social desirability within programme evaluations, particularly where those delivering interventions were involved in their evaluation, and although this possibility cannot be excluded, the recurrence of constraining and negative configurations across studies suggests that the evidence base was not uniformly favourable.

Future Implications:

The findings support a shift from isolated research initiatives towards longitudinal clinical academic pathways that connect internships, postgraduate education, fellowships with postdoctoral opportunities and substantive clinical academic roles. This requires organisational capacity to develop alongside individual capability, with protected research time, appropriate backfill, NHS-HEI partnerships and embedded research roles incorporated into workforce planning, while mentoring should extend beyond technical supervision to include sponsorship, organisational navigation and career advocacy [41, 44]. Funding organisations should similarly strengthen procedural transparency, equitable application support and post-award continuity to reduce attrition following fellowship completion. The national clinical research career pathway framework introduced by UK research funders provides a scaffold for this shift; the programme theories presented here specify the local organisational conditions required for that framework to deliver equitable progression.

Implementation should be evaluated through sustained and equitable progression, including protected research time delivered, progression and retention, access to substantive research roles and distribution of funding opportunities across under-represented groups. Future research should prospectively test the programme theories across professions and service settings, particularly in mental health and community services where research infrastructure may be less developed, while examining whether the alignment of people, pathways, partnerships and platforms enables research capability to translate into sustained progression. Greater attention is also needed to equity-related mechanisms among ethnic minority and

Global Majority NMAHPs, for whom direct evidence remains limited. These priorities align with recent UK recommendations for integrated career routes, supportive organisational cultures, equitable employment conditions and stronger monitoring of NMAHP clinical academic workforce development [50].

Limitations:

This realist synthesis should be interpreted in light of several limitations. The evidence base was relatively small (17 sources) and heterogeneous, meaning that evidential support varied across programme theories, with some CMO configurations supported by multiple studies and others by fewer conceptually rich sources. Most evidence originated from UK National Health Service settings, strengthening relevance to the intended context while potentially limiting transferability to healthcare systems with different funding, employment and clinical academic arrangements. As CMO configurations and programme theories were developed through abductive and retroductive interpretation, alternative explanations remain possible despite iterative refinement, constant comparison, triangulation and review-team discussion. Publication bias also cannot be excluded because established or successful programmes may be more likely to be evaluated and reported, potentially under-representing programme challenges and unintended consequences. In addition, the exclusion of 419 records whose full texts could not be retrieved and 723 non-English publications may have introduced selection and language bias, while limited variation in critical appraisal scores meant that appraisal informed interpretation and weighting rather than strongly differentiating studies. Finally, relatively few studies directly centred ethnic minority or Global Majority NMAHPs, meaning that some programme theories drew on broader NMAHP clinical academic evidence alongside equity-specific studies. Few eligible intervention evaluations originated outside the UK, including from the United States; the international transferability of the programme theories therefore requires prospective testing, as recent comparisons of joint clinical academic appointments across healthcare systems suggest [49]. The findings should therefore be interpreted as generating explanations relevant to under-represented NMAHPs, with the strength of direct equity-specific evidence varying across programme theories.

Conclusions:

This realist synthesis explains how, why, for whom and under what circumstances interventions support under-represented NMAHPs to access and progress through clinical

academic careers. Across the evidence, sixteen programme theories demonstrated that progression is not driven by individual motivation alone but by the interaction between supportive organisational contexts and mechanisms that shape how clinicians perceive research careers. Generated programme theories indicate that effective clinical academic development requires coordinated, longitudinal interventions rather than isolated initiatives. In particular, the synthesis indicates that the binding constraint on workforce growth now lies downstream of current investment: without post-award posts, protected progression routes and embedded senior roles, further expansion of entry-level schemes risks accelerating rather than reducing attrition among the clinicians it is designed to retain. Organisational commitment, transparent funding pathways, inclusive leadership and sustained NHS-Higher Education partnerships emerged as essential contextual conditions for equitable career progression. By moving beyond describing barriers to explaining the mechanisms through which interventions succeed or fail, this synthesis provides an evidence-informed programme theory that can guide the design of equitable clinical academic pathways, strengthen research capacity among NMAHPs and support a more diverse, sustainable and research-active healthcare workforce.

Abbreviations

AACODS: Authority, Accuracy, Coverage, Objectivity, Date, Significance; CASP: Critical Appraisal Skills Programme; CMO: Context-Mechanism-Outcome; HEI: Higher Education Institution; IPT: Initial Programme Theory; JBI: Joanna Briggs Institute; MMAT: Mixed Methods Appraisal Tool; NHS: National Health Service; NIHR: National Institute for Health and Care Research; NMAHP: Nurses, Midwives and Allied Health Professionals; OSCHR: Office for Strategic Coordination of Health Research; OSF: Open Science Framework; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PT: Programme Theory; RAMESES: Realist and Meta-narrative Evidence Syntheses: Evolving Standards; SPIDER: Sample, Phenomenon of Interest, Design, Evaluation, Research type.

Supplementary Information

Additional file 1: Supplementary Tables S1-S4 (critical appraisal results for qualitative, cross-sectional, mixed-methods and commentary or conceptual sources), Supplementary Table S5 (CMO configurations and initial programme theory interpretations) and Supplementary Figure S1 (worked example of the analytic audit trail for Programme Theory 3).

Declarations

Ethics approval and consent to participate

Not applicable. This review did not involve human participants, human data or human tissue.

Consent for publication

Not applicable. The manuscript does not contain data from any individual person.

Availability of data and materials

All data generated or analysed during this study are included in this published article and its supplementary information files. The review protocol is registered with the Open Science Framework (DOI: 10.17605/OSF.IO/JS9CH). No new datasets were created.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AV: conceptualisation, design, data acquisition, screening and study selection as first reviewer, analysis and interpretation, drafting and critical revision of the manuscript. SV: critical review and editing of the manuscript. SS: independent screening of titles, abstracts and full texts, and study selection as second reviewer. OB: critical review and editing of the manuscript. MB: supervision; critical review and editing of the manuscript. All authors read and approved the final manuscript.

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During the preparation of this work the authors used Claude (Anthropic) to assist with language editing and formatting. Generative AI was not used to screen studies, extract data,

appraise evidence or develop the Context-Mechanism-Outcome configurations and programme theories, which are the authors' own work. All AI-assisted output was reviewed, edited and approved by the authors, who take full responsibility for the content of the publication.

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