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Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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The authors declare they have no competing interests

AUTHOR CONTRIBUTIONS

BC conceived the study, developed and conducted the survey, completed data analysis and interpretation and drafted, revised and agreed the final manuscript version for submission. LA contributed to data entry, analysis and interpretation. MS contributed to survey development. NP contributed to study design, survey development and data interpretation. PD contributed to survey development and data interpretation. All authors contributed to manuscript revision and approved the final version for submission. BC acts as the guarantor for the intellectual integrity of the data.

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DATA SHARING

All data pertaining to this study are reported in this manuscript.

ABSTRACT

Objective

To characterise the research profile of UK critical care physiotherapists including experience, training needs, barriers and enablers to engagement in critical care research. ‘Research’ was defined broadly to encompass activities related to quantitative and qualitative studies, service evaluations, clinical audit and quality improvements.

Design

Closed-question online survey, with optional free-text responses.

Setting

UK critical care community

Participants

UK critical care physiotherapists, regardless of clinical grade or existing research experience

Results

Two-hundred and sixty-eight eligible survey responses were received during the twelve-week study period (21 incomplete, 7.8%, n=16 no contact details). Respondents were based in university-affiliated (n=133, 49.6%) and district general (n=111, 41.4%) hospitals, and generally of senior clinical grade. Nearly two-thirds had postgraduate qualifications at Master’s level or above (n=163, 60.8%). Seven respondents had a doctoral level qualification. Respondents reported a range of research experience, predominantly data acquisition (n=144, 53.7%) and protocol development (n=119, 44.4%). Perceived research training needs were prevalent, including topics of research methods, critical literature appraisal, protocol development and statistical analysis (each reported by ≥50% respondents). Multiple formats for delivery of future research training were identified. Major barriers to research engagement included lack of protected time (n=220, 82.1%), funding (n=177, 66.0%), and perceived experience (n=151, 56.3%). Barriers were conceptually categorised into capability, opportunity and motivation themes. Key enabling strategies centred on greater information provision about clinical research opportunities, access to research training, secondment roles, and professional networks.

Conclusions

UK critical care physiotherapists are skilled, experienced and motivated to participate in research, including pursuing defined academic research pathways. Nonetheless wide-ranging training needs and notable barriers preclude further involvement. Strategies to harness the unique skills of this profession to enhance the quality, quantity and scope of critical care research, benefiting from a multi-professional national clinical research network, are required.

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ARTICLE SUMMARY

Strengths and limitations of this study

- Critical care is a complex specialty by nature requiring a multi-professional and research-enabled workforce to maximise research planning and delivery for optimum patient benefit
- This is the first survey to detail the research profile of UK critical care physiotherapists to assist in building research capacity within this profession as key component of the critical care workforce
- Barriers and enablers to engagement of critical care physiotherapists in research have been identified to support development of strategies to enhance future involvement
- Strengths of this study include sustained use of multiple routes of survey dissemination, ease and speed of completion, and potential for replicability and internationalisation
- Potential limitations include its profession-specific target population, lack of known denominator to determine accurate response rate, and clinician focus

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6 **INTRODUCTION**

7 Critical Care is an identified therapy arena within the UK’s National Institute for Health Research

8 (NIHR) (<https://www.nihr.ac.uk/nihr-in-your-area/critical-care/>). National and local Clinical Research

9 Network (CRN) infrastructure is coordinated to provide oversight and logistical support enabling high

10 quality conduct and delivery of an NIHR national research portfolio

11 (<http://www.nihr.ac.uk/research-and-impact/nihr-clinical-research-network-portfolio/>). Currently

12 96% of NHS England’s intensive care units (ICU) contribute to the NIHR national portfolio of clinical

13 research studies, one of the most engaged critical care research networks internationally ¹. Since

14 2014 the coordinating NIHR Critical Care National Specialty Group (CC NSG), currently led by

15 physicians, has engaged physiotherapy representation within it alongside other allied health

16 professions (AHP) including nursing and pharmacy, recognising that physiotherapists are key

17 members of the multi-professional team contributing to achievement of its research agenda.

18 Fostering multi-professional research workforce development and sustainability is an important

19 mission for the CC NSG.

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Developing a strategic approach to research-capacity building in allied health professions, such as physiotherapy, may be complex but is important for enhancing healthcare research across multiple aspects including basic science, translational, service delivery and implementation ². Increasing emphasis on evidence-based practice has required greater potential and expectation for AHP assimilation of research to inform the clinical decision-making process ^{3 4}. However contributing to multi-professional research effort at scale in NHS critical care could require involvement of clinicians trained to appropriate regulatory Good Clinical Practice (GCP) standards ⁵, but who lack other formal research training or experience ⁶. Identifying research-trained physiotherapists and establishing levels of skill, competency and expertise could be of significant value in supporting the planning and delivery of the best research for patient benefit, while facilitating and building collaborations, and raising recognition of the profession.

Intensive care medicine, as a profession, encourages exposure to clinical research at varying stages of professional training for all trainee clinicians and a smaller number choose a more structured clinical academic research training pathway ⁷. In the absence of a formal postgraduate clinical training programme for critical care physiotherapy, clinicians have empirically integrated research commitments within existing clinical roles to acquire skills and experience, supplemented by

postgraduate qualifications albeit access to these may be subject to local variability in financial and logistical support. The advent of the NIHR over the last decade has provided dedicated allied health profession pathways for pursuing a defined clinical academic career (<https://www.nihr.ac.uk/funding-and-support/funding-for-training-and-career-development/training-programmes/>). However, capturing these data at a profession-wide level is challenging with a paucity of work in this field. This survey therefore aimed to characterise the research profile of UK critical care physiotherapists, perceived training needs, and barriers to engagement in critical care research.

METHODS

Study design and approval

This was a national prospective online survey of UK critical care physiotherapists conducted on behalf of the UK NIHR Critical Care National Specialty Group (<http://www.nihr.ac.uk/nihr-in-your-area/critical-care/>). The survey did not require ethical approval (UK Health Research Authority⁸), and no local institutional Research & Development Department approval was necessary (Guy's and St.Thomas' NHS Foundation Trust, London, UK). Participation was voluntary and consent implied by accessing and completing the online survey. In the absence of reporting guidelines for survey research⁹, this study was conducted and reported in keeping with suggested good practice¹⁰.

Sampling and survey population

Survey respondents comprised any UK critical care physiotherapist, regardless of existing research experience or clinical grade. At present there is no formal database of such clinicians, and we adopted a pragmatic approach to enable responses from as many clinicians as possible within a defined timeframe who aligned themselves as a physiotherapist specialising in critical care. The survey was not restricted to either adult or paediatric sub-specialties.

Survey development

A closed-question survey was designed by the authors (Online Supplement, Section E1). The draft survey was developed offline, and piloted by 6 critical care physiotherapists of varying clinical seniority grade and existing research experience to refine the quality and interpretation of questions¹¹. Feedback was requested on i) comprehension and interpretation of questions, ii) flow, salience, acceptability and ease of completion, iii) identification of missing items requiring questioning, or response options to existing questions, iv) time required for survey completion¹². Comments from this process resulted in clarification of seven questions and additional responses added to six

questions. On average the survey was reported to take no more than 10mins to complete. Once transferred to the online electronic format, the final survey was tested by one further independent physiotherapist.

The final survey consisted of four sections; i) Background (demographics), ii) Research Experience, iii) Research Training Options, iv) Barriers to Research Engagement. ‘Research’ encompassed activities related to quantitative studies, qualitative studies, service evaluations, clinical audit and quality improvements. If completed in full, the survey totalled 25 questions. The majority of questions involved response selection from multiple options which were not ranked, nor were respondents asked to mark their response in terms of perceived importance or grading. Where applicable, questions always contained an ‘Other’ option to enable free-text comments from respondents.

Survey Distribution

Survey distribution occurred for an *a priori* defined 12week period, with an additional 4week follow-up period to contact respondents with missing data. The lead author’s contact details were circulated on the survey link to respond to any individual queries regarding survey completion. An electronic link enabled respondents to access the online survey and a variety of strategies to access potential respondents were employed including: the NIHR CC NSG and CRN distribution lists; advertising on the NIHR CC NSG website; the UK Critical Care Research Group distribution list; clinical professional specialist interest group websites and membership newsletters; local networks of clinical colleagues; social media links; a national UK critical care course for physiotherapists; and snowballing. Regular re-circulation of the survey link was conducted via these routes during the 12-week period. At the end, incomplete survey responses were identified. Where respondents left contact details attempts were made to request missing data. Response data were recorded electronically in bespoke survey software (Survey Monkey®, San Mateo, CA, US, <https://www.surveymonkey.net/>) and then exported into Microsoft Excel format (Microsoft Office 2013, Microsoft Corp, Redmond, WA, US) for analysis.

Data analysis

Quantitative data were analysed descriptively using counts, percentages and 95% confidence intervals (CI) where appropriate. Continuous data are reported as means±standard deviation (SD) and ordinal data as medians (inter-quartile range, IQR) where applicable. Qualitative comments were analysed for recurrent themes using free text analysis¹³ by one researcher (LA) and reviewed by the primary author (BC), removing any potentially identifiable text in advance. In the absence of

a known denominator for the total number of UK critical care physiotherapists, it was not possible to set a target *a priori* response rate. Instead the overall number of responses acquired during the 12-week survey period were collated. Analyses were performed using GraphPad Prism version 7.0d (GraphPad Software, La Jolla, CA, US, www.graphpad.com).

RESULTS

Respondents

Two-hundred and seventy-one responses were received during the survey period (30th August to 22nd November 2016, with additional follow-up as aforementioned), of which 3 were excluded (n=2 duplicate, n=1 non physiotherapist), leaving 268 in the final analysed sample. Twenty-one responses remained incomplete after attempted contact (7.8%, n=16 no contact details). Demographic data for the cohort are provided in Table 1. Respondents were almost equally based within University-affiliated (n=133, 49.6%) or District General (n=111, 41.4%) hospitals, although the vast majority were located in England (n=234, 87.3%). Median (IQR) clinical seniority of respondents was Band 7 (6-7) indicating a senior, specialist grade (higher bandings indicate greater seniority). Nearly two-thirds of respondents had a postgraduate qualification at Master's level or above (including individual modules) (n=163, 60.8%), with funding provided locally in half of cases (n=132, 49.3%). Seven respondents had a doctoral level qualification.

Research experience

Two respondents did not complete this section (0.7%). Of the remaining 266 respondents, 227 (84.7%) indicated existing research experience. Frequency of involvement in types of research activity varied (median (IQR) 2 (1-3) different activities, Figure 1). Most commonly respondents indicated experience of participation in local/regional audits or service evaluations (n=204 responses), with 116 respondents reporting attending a research-related course. One-hundred and twenty-nine respondents reported involvement in either multi- or single-site studies, and 76 had research publication experience.

Sixty-five respondents (24.2%) indicated current involvement in research as chief (n=13 responses), principal (n=17 responses) or co- (n=21 responses) investigator or in a research physiotherapist/assistant role (n=21 responses). Other roles included strategic positions e.g. as director of an institutional research centre. Respondents were predominantly involved in quantitative study types (randomised and non-randomised controlled trials, n=22; observational studies, n=23 responses), but also reported methodological and review-based research (feasibility

studies, n=19, systematic review, n=2, methodological study, n=1 responses) and qualitative (n=20 responses) research design. Survey (n=4 responses), epidemiological (n=4 responses) and case study, proof-of-concept and mixed methods (n=1 responses each) research studies were also reported. The majority of studies that respondents were involved in were either publicly or self-funded (n=53, 81.5%).

Two-hundred and fifty-seven respondents (95.9%; n=11 (4.1% missing data) described research activities they had previous or current experience of (Table 2). More than fifty percent had been involved with data acquisition or completion of outcome measure assessment in studies, followed by protocol development. The vast majority of respondents had no allocated time for research in their current role (n=210, 78.4%, n=12 missing data, 4.5%). On average, respondents with some allocated research time ranged from between 3days/week to full time (n=4 responses, 1.5%), between 1 and up to 3 days/week (n=15, 5.6%), less than one day/week (n=18, 6.7%) and less than one day/month (n=9, 3.3%).

Seventy-one respondents (26.5%) had completed Good Clinical Practice (GCP) training. Of the remaining 186 respondents, 149 (55.6%) reported a lack of familiarity with what GCP involved, 27 (10.1%) reported they would like to complete GCP training but could not access it locally, 7 (2.6%) were scheduled to attend and 3 (1.1%) did not feel GCP training was necessary.

Research training needs

Respondents were asked to identify research training topics they would benefit from (Figure 2). Two-hundred and fifty-one respondents (93.7%) completed this question (n=17 missing data, 6.3%). Most frequently reported topics included research methods, critical appraisal of literature, protocol development and statistical analysis, all identified by at least fifty percent of respondents. Least reported training topics included epidemiology, and recruitment and consent. Respondents (n=250, n=18 missing data, 6.7%) reported a variety of methods of delivery of research training topics including courses/workshops run either on a weekday (full day, n=135 (50.4%), half-day, n=62 (23.1%)), weekend (full day, n=76 (28.4%), half-day, n=37 (13.8%)) or evening (n=33, 12.3%) or via online (n=145, 54.1%). Free-text comments from respondents in relation to this question are summarised in the Online Supplement (Table E1). Twenty-eight respondents (10.4%) reported they would not be interested in any research training.

Barriers and enablers to research engagement

Of respondents not currently involved in research (n=195, 72.8%, n=21 missing data (7.8%)), the vast majority (n=167, 85.6%) indicated they would like the opportunity. Research activities that respondents expressed interest in included data collection/recording (n=142 responses, 53.0%); leadership and conduct of own projects (n=129 responses, 48.1%); dissemination activities (n=114 responses, 42.5%); data analysis and interpretation (n=109 responses, 40.7%); writing abstracts for conference submission (n=96 responses, 35.8%); manuscript writing for publication (n=87 responses, 32.5%); recruitment and consenting (n=83 responses, 31.0%); eligibility screening (n=72 responses 26.9%).

All respondents, regardless of existing involvement in research, were asked to indicate perceived barriers to physiotherapy involvement in critical care research, and initiatives to improve this (termed 'enablers') (Table 3). Most frequently identified barriers were lack of protected time (n=220 responses, 82.1%), lack of funding (n=177 responses, 66.0%) and lack of experience (n=151 responses, 56.3%). Key enablers centred on information provision including knowledge of local critical care physiotherapy studies and around opportunities for involvement in studies. Free-text comments from respondents in relation to this question are summarised in the Online Supplement (Table E2).

Qualitative comments from respondents regarding any aspect of the survey are summarised and themed in the Online Supplement (Tables E3 and E4).

DISCUSSION

To our knowledge, we report the first findings of their kind detailing characteristics of experience, training and engagement in research of UK critical care physiotherapists. We believe these to be unique data from a national and international perspective targeting clinicians directly. We demonstrate a skilled, experienced and motivated workforce constrained by logistical, knowledge-related and professional cultural factors. Key enablers to research engagement primarily centre on improvements in information provision around critical care physiotherapy and non-physiotherapy studies, broadening opportunities for formal research involvement, increased access to training and greater numbers of secondment opportunities into established research groups. Findings from this survey underscore the importance and value of building research capacity in the critical care physiotherapy profession^{2 14}, and enable the prioritisation of actions to support developing and sustaining a research-enabled critical care workforce involving physiotherapy.

Significance of the findings

Research activity in UK ICUs is evidently high, as reflected by the percentage of units supporting the national research portfolio. However this does not appear commensurate with equally high levels of research involvement by physiotherapists. Our survey findings suggest a potential disconnect, highlighted by the depth of detail we have captured at individual clinician level in particular around barriers to involvement, in contrast to the relatively insensitive metrics used to determine research delivery at a unit-level. Clinicians indicated a wide range of research experience that, if harnessed and nurtured appropriately, could support future studies led by, and in collaboration with, critical care physiotherapists. In turn this could assist in maintaining and diversifying the national portfolio beyond existing levels. Critical care is by nature a complex specialty provided by a multi-professional team; in turn, the best research for patient benefit is likely to arise secondary to engagement of all members of that multi-professional team.

To understand factors contributing to current levels of physiotherapy engagement in critical care research, we broadly mapped results to a common behavioural change model, the COM-B framework (Capability, Opportunity, Motivation-Behaviour) (Figure 3)¹⁵. Addressing any component of COM-B can facilitate behaviour modification; in this instance, the ‘behaviour’ being involvement in research. For example, major opportunity-related barriers reported by clinicians were lack of protected time and funding with clinicians attempting to incorporate research opportunity within day-to-day clinical roles. This scenario of research capacity balanced against resource restriction is not uncommon within physiotherapy^{16 17}, and may be difficult to immediately rectify with ever-increasing demands on clinical service delivery and competing priorities. That said, one enabler identified by respondents focused on awareness of available funding sources and this could be facilitated by identifying colleagues with knowledge and experience around local and national funding options for guidance. Insufficient knowledge, skills and confidence (capability) were other important barriers. Increased access to research training was a key enabler that could target this aspect. Importantly though, findings from this survey highlighted the need to consider flexible, multimodal and innovative forms of training in terms of content, design, format and delivery. One third of respondents reported that identifying key contacts with their local organisation would facilitate involvement in research. Whilst this has obvious practical benefits, it further speaks to the broader concept of requiring role models, mentors and leadership (motivation barrier) to set a template and provide guidance.

Quantitative and qualitative findings from this survey suggested a distinction between clinicians who had transitioned into a defined academic path e.g. research-specific Master's level qualifications and/or subsequent doctoral training, and those who had skill and experience (often considerable) and keenness for research involvement but who preferred to remain primarily clinical-facing; the concept of clinical academics and academic clinicians. The extent to which this concept truly exists requires further exploration amongst critical care physiotherapists, but could highlight differing approaches needed to integrate these different roles into the research community. Presence of a positive research culture (both within physiotherapy departments and ICUs), perceived value of research by own and other professions, and the overall research profile of the physiotherapy profession were all factors identified by respondents that influenced their opportunity for involvement in research; in particular recognition from senior management and support from critical care colleagues were reported as beneficial factors. These findings echo similar themes identified from a previous survey of physiotherapy managers' of their departmental staff ¹⁶, and a separate observational study of physiotherapist researchers having completed PhDs ¹⁸. In this latter study, key suggestions for improving research academic career paths included roles that allowed for clinical-research and academic-clinical combinations, securing adequate funding for physiotherapy research positions, and enhancing collaboration between academic and clinical researchers ¹⁸. Certainly fostering partnerships between Universities and NHS institutions in the UK, in particular via Academic Health Sciences Centres, for honorary academic appointments could be valuable for accessing academic support and mentorship for clinicians. Furthermore improving patient healthcare through embedding research into routine clinical care is key for the NIHR, in line with NHS Constitution for England principles ¹⁹ – this ethos provides support to those aforementioned clinicians wanting greater research exposure whilst remaining in direct clinical positions.

Moving forwards, these survey findings help to identify strategies to support greater involvement of critical care physiotherapists in research; indeed the impact of these findings could be more wide-reaching in principle relating to other allied health professions. Improving information provision around existing studies and secondment opportunities for involvement could be achieved through local and national research-based infrastructure; encouraging links between existing professional organisations to combine resources and promote funding and training opportunities; considering alternative models of working to incorporate research time into clinical job descriptions may be required, and engaging managers proactively to recognise the value of research-trained physiotherapists embedded in clinical services; and profiling positive examples of success to increase awareness amongst the multi-professional critical care team about the benefit of physiotherapy

involvement in studies. In addition, developing peer-support networks akin to that which has been established by intensive care medicine trainees (<http://www.rafrainees.com/>), may be valuable for sharing experiential learning, offering access to mentors, and collaborative working, and the newly formed UK AHP/Nursing Network for Critical Care Research is an example of this. Finally, collaborating with other critical care professions to deliver generic research methods training would not only ensure efficient utilisation of resources and personnel, but likely broaden the depth and breadth of the overall learning experience and foster inter-professional links, and building research skills and training into physiotherapy-specific competencies would mirror the approach taken in other medical specialities.

Critique of the method

These novel data from both quantitative and qualitative analysis highlight the research profile of UK critical care physiotherapists. Whilst the target population of respondents was profession-specific, which could limit generalisability of findings, this study echoes the process and outcomes of a recent survey of UK intensive care medicine trainees which sought to understand how to improve trainee access to critical care research opportunities ⁶. Furthermore, the current survey was in itself non-profession focused i.e. no questions were designed or phrased specifically related to physiotherapy per se. It could therefore easily be replicated across other allied health and nursing roles with little, if any, modification to generate larger volumes of similar characteristic data.

We employed a number of design and formatting strategies to enhance user-acceptability and completion of this online survey, including a personalised opening cover letter and optimising all available electronic functionality e.g. filtering of questions according to ‘Yes/No’ response, and limiting progression until specific answers provided. As the focus of the survey was limited to acquiring descriptive information and not responses for inferential analysis, item generation and reduction were simplified completed internally by the review authors during survey design which also allowed for confirmation of both content and construct validity ¹². Nonetheless we recognise further psychometric testing of the survey e.g. formal cognitive interviewing may have been methodologically valuable ²⁰. Our response formats were predominantly closed-question nominal responses but always with the option for free-text respondent comments, and questions followed suggested recommended approaches e.g. categorised into sub-sections, numbered and response options appearing on separate lines ¹². In addition we adopted further strategies designed to improve online surveys e.g. multiple-item screens and short-entry boxes ¹². For pragmatism, clinical sensibility testing and face validity were embedded in the pilot phase of our survey development

using a convenience sample of critical care physiotherapists specifically of differing clinical grade and research experience to represent differing responses, a process which successfully refined the survey¹². We purposefully aimed to minimise additional burden to potential respondents by not expanding the number of clinicians involved in this piloting.

A notable strength of our study is the use of sustained, multiple, and diverse routes of dissemination for maximising awareness and completion amongst the target population during the survey period, spanning clinical, research and professional remits. This approach was essential given the absence of a formal central registry for identifying potential respondents. Nonetheless lack of an accurate respondent denominator precludes us determining an overall response level, and consequently challenges the representativeness of our findings. That said, our response level is more than four times the number of physiotherapy members in the UK Intensive Care Society (n=60)²¹, and is estimated to reflect critical care membership within the Association of Chartered Physiotherapists in Respiratory Care (Personal Communication; current 2017 membership 1050, assuming equal distribution across the four core areas of critical care, surgery, long-term conditions and paediatrics (<http://www.acprc.org.uk/>). Furthermore we are confident of having adopted all available opportunities for targeting respondents, and that our response level has provided adequate data to answer our original study aims with consistent themes arising from the data. However we accept the potential for inherent self-selection and response bias and we have no formal means of assessing degree of non-response and/or any differences between characteristics of responders versus non-responders^{22 23}.

Our choice of online survey versus alternative routes such as postal, was also pragmatic in light of lack of contact details for potential respondents such that circulation of the electronic link to the survey was the most efficient method for enabling response. We included a four week follow-up period following official closure of the survey to contact respondents to obtain missing data, a challenge to all survey studies regardless of interface, and within our sample our overall proportion of missing data was low (<8%). Our survey primarily targeted clinical rather than academic critical care physiotherapists albeit we did not specifically exclude responses from these individuals but nor did we pursue avenues of survey promotion or dissemination via academic organisational routes; ultimately a very small proportion of respondents indicated they were based in University settings. In the future specifically targeting/including academic clinicians may provide valuable information as their experience of engagement in critical care research may differ due to context and environment

which may have been missed in the current results. That said, similar challenges around determining an accurate denominator for these individuals may still exist.

Importantly the definition of a ‘critical care physiotherapist’ was open to individual interpretation to maximise volume and breadth of response level. We did not restrict this to any geographical location e.g. specifying physiotherapists only working in intensive care or high dependency units, in the knowledge that research with critically ill patients may transition clinical environments, be irrespective of levels of care ²⁴, and indeed continue beyond the acute hospitalisation period. However we acknowledge that in the latter stages of recovery physiotherapists from other specialist areas may become involved in delivery of services to post critical illness patients, and they may not have responded to a survey targeted at ‘critical care’ physiotherapists. In addition, physiotherapists in both the adult and paediatric sector were eligible to respond, and from all clinical grades of seniority recognising that empirically, research opportunities are increasingly available to more junior clinicians. Furthermore, we adopted a broader definition of the term ‘research’ to encompass clinical audit, service evaluations and quality improvements to capture data on all activities that clinicians may be involved in and utilise broad research-based skills. Again, this approach helps to consider translation of the findings to other non-physiotherapy professions where involvement in this range of activities may occur.

Finally, as with all survey data, the findings are relative to the survey period and we acknowledge that additional numbers of clinicians may have attained postgraduate qualifications or involvement in research in the interim period from survey conduct to publication of results.

CONCLUSION

UK critical care physiotherapists have skill and experience in many aspects of research. A large number have postgraduate qualifications, including those indicating a defined academic research path. Nonetheless wide-ranging training needs and notable barriers preclude further involvement. These data may help inform approaches to harness the unique skills of this profession to enhance the quality, quantity and scope of critical care clinical research to maximize patient benefit, within a multi-professional national clinical research network, and may have international applicability.

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TABLES

Table 1. Demographic data for survey respondents.

Characteristic	Respondents (n=268)
Employment organisation	
University-affiliated hospital	133 (49.6)
District general hospital	111 (41.4)
Other – Specialist centre	10 (3.7)
– Unclassified	8 (3.0)
– University	5 (1.9)
– Community	1 (0.4)
Location	
England	234 (87.3)
Scotland	16 (6.0)
Wales	12 (4.5)
Northern Ireland	6 (2.2)
Grade of seniority^	
5	10 (3.7)
6	73 (27.2)
7	127 (47.4)
8a	36 (13.4)
8b	4 (1.5)
Other (not specified)	5 (1.9)
Not given	13 (4.9)
Postgraduate qualification [#]	
Master of Science	80 (29.9)
Master's level module	66 (24.6)
PG Certificate	37 (13.8)
PG Diploma	21 (7.8)
Master of Research	10 (3.7)
None	9 (3.4)
PhD	7 (2.6)

Professional Doctorate	0
Other*	35 (13.1)
Funding source [#]	
Local organisation	132 (49.3)
Self-funded	73 (27.2)
Established funding pathway	29 (10.8)
Professional body	15 (5.6)
Other~	4 (1.5)

Date reported as n (%). ^ indicated UK Agenda for Change pay structure for allied health professionals; higher numbers (and consecutive letters) indicate more senior, specialist clinical grades. [#]indicates counts representing frequency of occurrence where multiple options could be selected, and totals will exceed 268 (100%). * 'Other' categories include: Currently undertaking a postgraduate qualification (MSc, PhD, MRes), n=14; Miscellaneous mix, n=7; Leadership/Education qualification, n=6; Prescribing qualification, n=3; Pre-registration MSc, n=3. ~ 'Other' categories include: Charity, n=3; Specialist Interest Group, n=1

Table 2. Previous or current research activity experience of respondents

Research activity	Responses*
Data acquisition/completion of outcomes measures or assessments	144 (53.7)
Protocol development	119 (44.4)
Recruitment and consent	82 (30.6)
Statistical analysis and data interpretation	81 (30.2)
Intervention delivery	75 (28.0)
Database management	69 (26.8)
Patient and public involvement and engagement	68 (25.4)
Ethics/Research and Development approvals application process	64 (23.9)
Manuscript preparation/writing	63 (23.5)
Screening for eligibility	60 (22.4)
Completion of study case report forms	46 (17.2)
None	17 (6.3)

*Data reflecting n=257 respondents (n=11 missing data). Multiple options permitted per respondent

Table 3. Barriers and enablers to physiotherapy involvement in critical care research

Barrier	Responses*
Lack of protected time	220 (82.1)
Lack of funding	177 (66.0)
Lack of experience	151 (56.3)
No critical care-related research conducted in Physiotherapy Department	110 (41.0)
Lack of confidence	110 (41.0)
Insufficient skill set	97 (36.2)
Unsure what opportunities are available and/or unsure who to approach to find out	96 (35.8)
Lack of support from senior staff/management	86 (32.1)
Insufficient knowledge base	69 (25.7)
No research currently conducted in Critical Care Department	68 (25.3)
Clinical rotations too short to allow involvement	35 (13.1)
Enabler	
Greater information about local critical care physiotherapy studies	185 (69.0)
Wider advertising of opportunities for involvement	153 (57.1)
Increased access to research training	150 (56.0)
Creation of secondment positions into research teams	150 (56.0)
Greater information about local critical care studies	149 (55.6)
National physiotherapy network to link research-active critical care physiotherapists	147 (54.9)
Increased engagement at senior staff/management level	120 (44.8)

Creation of combined clinical-academic positions	114 (42.5)
Greater familiarity/understanding of available funding sources	114 (42.5)
Greater support from Critical Care colleagues e.g. intensivists	102 (37.1)
Knowledge of key contacts within local organisation	84 (31.3)
Option for including as a rotational objective	66 (24.6)

*Data reflecting: barriers, n=244 respondents (n=24 missing data); enablers, n=247 respondents (n=21 missing data)

FIGURES

Figure 1. Frequency of occurrence of research experience types

Data reflecting responses from n=227 respondents (n=39 reporting no existing research experience, not categorised). a = Completed a dedicated postgraduate research qualification, n=31. b = First author publication, n=28. c = Co-author publication, n=40. d = Senior/last author publication, n=8. e = Submitted/presented a conference abstract, n=91. f = Active involvement in a multi-centre study, n=55. g = Active involvement in a single-centre study, n=74. h = Participated in local or regional clinical audit or service evaluation, n=204. i = Attended a research-related course, n=116. Multiple options permitted per respondent

Figure 2. Frequency of responses for research training needs

Data reflecting responses from n=223 respondents (n=17 missing data; n=28 reporting no research training required and not categorised). a = Research methods, n=122. b = Epidemiology, n=41. c = Critical appraisal of literature, n=119. d = Protocol development, n=121. e = Data management, n=96. f = Statistical analysis, n=132. g = Research team collaboration, n=69. h = Ethics/Research and Development application process, n=96. i = Writing a scientific abstract, n=82. j = Writing a manuscript for publication, n=92. k = Applying for grant funding, n=101. l = Applying for individual funding, n=85. m = mentorship, n=96. n = Systematic review and meta-analysis/synthesis, n=91. o = Recruitment and consent, n=45

Figure 3. Influencing factors contributing to critical care physiotherapists’ involvement in research mapped to the COM-B model¹⁵

Abbreviations: PT = physiotherapy. ICU = intensive care unit

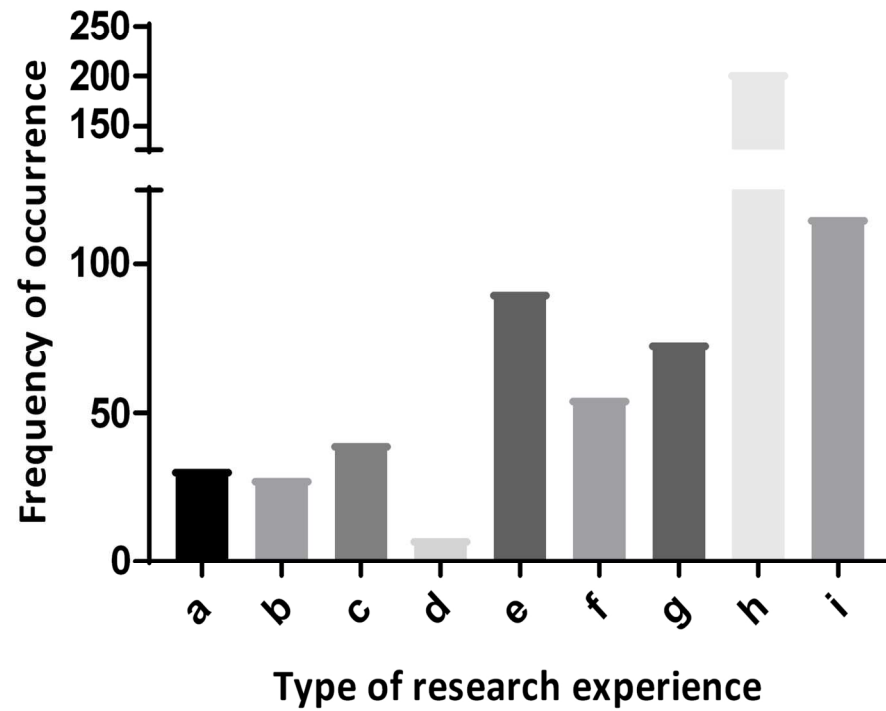


Figure 1. Frequency of occurrence of research experience types

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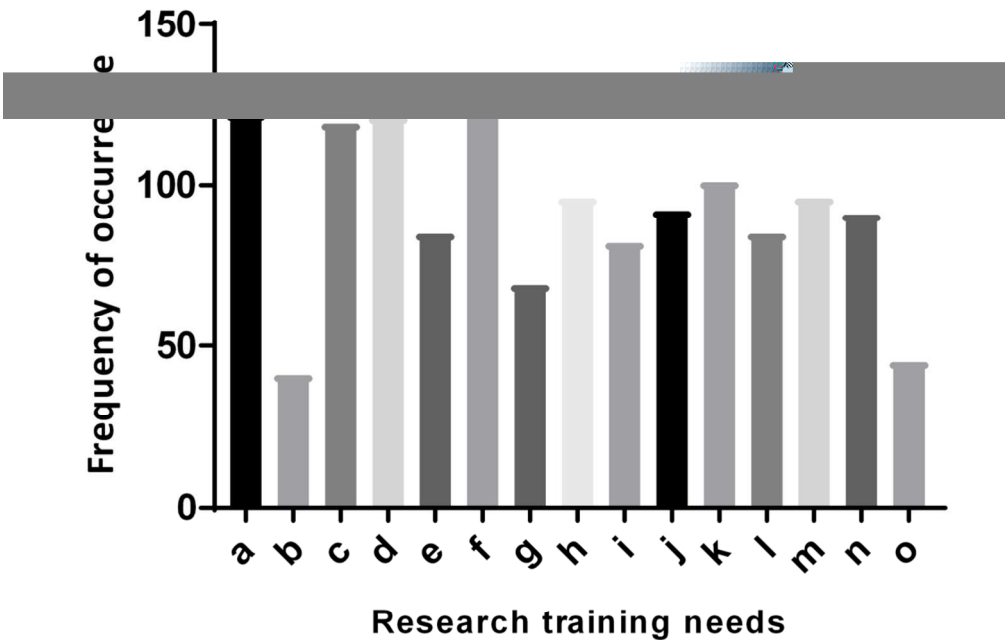


Figure 2. Frequency of responses for research training needs

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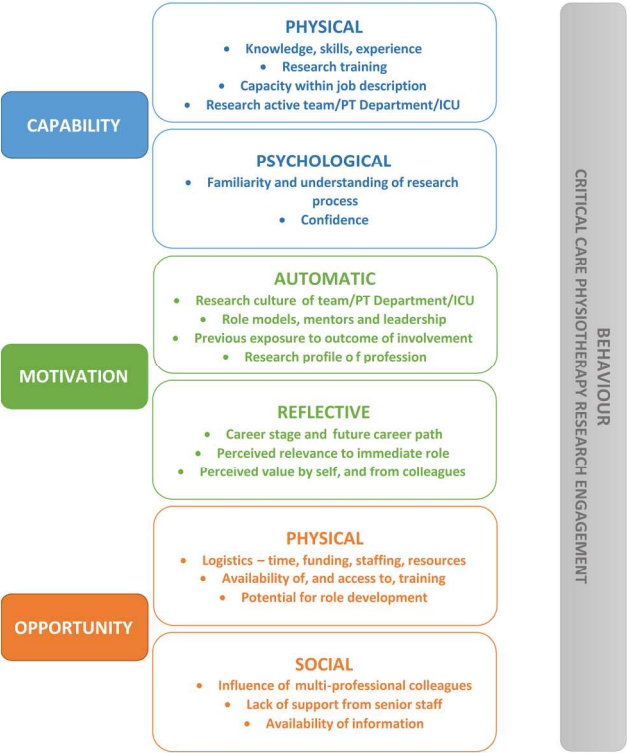


Figure 3. Influencing factors contributing to critical care physiotherapists' involvement in research mapped to the COM-B model¹⁵

197x160mm (300 x 300 DPI)

Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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SUPPLEMENTAL INFORMATION

E1. Research survey

The below is a Microsoft Office Word version of the survey uploaded onto an electronic server for online completion (note formatting changes between differing interfaces).

Section 1. INTRODUCTION

You are invited to participate in this survey to describe the current research skills profile and training needs of UK critical care physiotherapists. This survey is designed for completion by **all** critical care physiotherapists, regardless of research experience to help inform our understanding of this subject. In particular the survey will collect data on postgraduate research qualifications, research experience, resources to enhance research skills and training, and perceived barriers to engagement with research.

If you have any questions relating to the survey or its completion, please contact Dr. Bronwen Connolly at Bronwen.connolly@nhs.net.

Your participation is highly valued, and we thank you for your time. Please note that once you commence the survey you will not be able to return at a later date to complete it. Pilot testing of the survey indicates it takes approximately 10 minutes to complete – therefore please ensure you have this time available to complete the survey in its entirety.

Thankyou for your consideration and participation

Dr. Bronwen Connolly, on behalf of the NIHR Critical Care Speciality Group

Bronwen Connolly MSc, PhD, MCSP

Consultant Clinical Research Physiotherapist, Critical Care

NIHR Postdoctoral Research Fellow

Lane Fox Respiratory Unit

St Thomas' Hospital

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Bronwen.connolly@nhs.net

Section 2. BACKGROUND

1. Participant name (optional)
2. Email address for future contact (optional)
3. Current job title (free text box)
4. Type of employment institution:
 - University hospital
 - DGH
5. Location:
 - England
 - Wales
 - Northern Ireland
 - Scotland
6. Current Agenda for Change grade (free text box)
7. How many years qualified (free text box)
8. How many years in current post (free text box)
9. Have you undertaken any of the following (tick all that apply):
 - PhD
 - Professional Doctorate
 - Master of Science
 - Master of Research
 - Master's level module (stand alone)
 - Post-graduate Diploma
 - Post-graduate Certificate
 - Other academic qualification (please specify)
10. Funding source:
 - Self-funded
 - Local funding

NIHR pathway
Other (please specify)
(if more than one award applied, please complete for most recent award and state which this is)

Section 3. RESEARCH EXPERIENCE

11. Which statement(s) best describe your existing research experience (please tick all that apply)

- I have completed a dedicated postgraduate research qualification e.g. MRes, PhD
- I have a first author publication
- I have a co-author research publication
- I have submitted/presented a conference abstract/poster/presentation
- I have had active involvement in a multi-centre study e.g. recruitment, data collection
- I have had active involvement in a single-centre study e.g. recruitment, data collection
- I have participated in local or regional audit or service evaluation
- I have attended a research-related course
- None at all
- Other (please comment)

12. Are you currently involved in research: YES/NO

If YES, in what capacity:

- Chief Investigator of a study
- Principal Investigator of a study
- Co-investigator of a study
- Research physiotherapist/assistant
- Other (please specify)

If YES, please indicate the type of study:

- Randomised controlled trial
- Non-randomised controlled trial
- Observational study
- Feasibility study
- Epidemiological study
- Qualitative study

If YES, is the study commercially funded: YES/NO

13. What research activities have you previously or currently experience of:

(tick all that apply)

- Protocol development
- Patient and public involvement in research study
- Ethics and R&D approvals application process
- Screening for eligibility
- Recruitment and consent
- Completion of case report forms
- Data acquisition/completion of outcome assessments
- Intervention delivery
- Database management
- Data analysis
- Manuscript preparation
- Other

14. Have you undertaken Good Clinical Practice training:

- Yes
- No, I wanted to but could not access it
- No, but I am scheduled to attend
- No, I don't feel this is necessary
- No, I don't know what this is

15. How much of your time is currently spent in research (report in hours/week or %WTE)

16. How is this research time funded:

- Costed as part of research study
- Individual funding pathway e.g. NIHR
- Established component of current clinical position
- Unfunded, conducted during existing clinical position
- Not funded, conducted in own time

Section 4. RESEARCH TRAINING OPTIONS

17. What research training topics/resources would you like available:

- Research methods
- Epidemiology
- Critical appraisal
- Protocol development
- Data management

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- Statistical analysis
- Research team collaboration
- Ethics and R&D approval processes
- Writing a scientific abstract
- Writing a manuscript for publication
- Applying for grant funding
- Applying for research agency fellowships e.g. NIHR, Health and Care Research Wales or other devolved nation-specific
- Mentorship
- Systematic review/meta-analysis/meta-synthesis
- Consent
- Other (please specify)

18. How would you like these delivered:

- One day course/workshop
- Half day course/workshop
- Evening course/workshop
- Weekday
- Online
- Other (please specify)

Section 5. BARRIERS TO RESEARCH ENGAGEMENT

19. If you are not currently involved in research, would you like to be (in any capacity):

YES/NO

20. Select any barriers you identify to participating in research:

- Insufficient skill set
- Insufficient knowledge base
- Research not happening in local critical care
- Unfamiliar with critical care research happening in local physiotherapy
- Department
- Not sure what opportunities are available
- Rotations too short to complete a project
- Don't know how to find out about research/who to approach
- Lack of time
- Lack of funding

Lack of support from senior staff/management

Lack of confidence

Lack of experience

No barriers identified

21. What opportunities would you like to get involved with:

Patient screening for eligibility

Recruitment and consent

Data collection and recording

Data analysis and interpretation

Abstract writing for conference submission

Manuscript writing for publication

Poster or other presentation opportunities

Orchestrating own project (protocol development, grant preparation etc)

I am not interested in any research opportunities

Other (please specify)

22. What initiatives do you think may help improve physiotherapy involvement in critical care research:

Greater information about local critical care research studies

Greater information about local critical care physiotherapy research

Clear opportunities for involvement

Increased engagement at managerial level for undertaking research qualifications/integrating research into existing roles

Recognized rotational objective

Increased access to research training opportunities

Creation of combined clinical-academic positions

Creation of secondment positions into research teams

Greater familiarity with funding opportunities

Knowledge of key contacts within local organization

National physiotherapy network to link research-active physiotherapists

Other (please specify)

Please feel free to add any additional comments or suggestions regarding any aspect of this questionnaire

E2. Free-text comments for ‘Research training needs’

Additional free-text comments that respondents provided in response to identifying research training needs, and additional topics from them, are summarised in Table E1. Some respondents suggested that the skills necessary to complete research were often found within clinical Masters’ programmes, but there was a frequent request for refreshers and updates in research methods for those who had completed training but been unable to maintain skills. Importantly, some participants highlighted that even with training available, there needed to be support to release staff for training to prevent under-staffing and clinical workloads from taking priority.

A number of free-text comments mirrored those already provided as response options to this question e.g. writing a manuscript for publication, statistical analysis. Others were identified as barriers or enablers to engagement in research that linked to comment made in response to the subsequent question.

Table E1. Analysis of free-text comments regarding research training needs

Qualitative comment	Theme
<i>"Not sure Interest would depend on activity and needs at the time the training is available. Also level of training"</i>	None
<i>"actually probably a bit of everything, I have attempted to write a paper twice, one I submitted but it got turned down, and then I gave up as it takes so much of your own time to sort."</i>	Writing a manuscript for publication*
<i>"Nobody has any time or staffing to release to research unless your job was a research job. Training in this subject is so important however, I think we all leave it to someone else who has the connections, expertise and time."</i>	None (Barrier of 'Lack of protected time')
<i>"I am fortunate to have existing experience developed across a number of these areas through my research positions to date, and have access to all training required. I think there should be availability of all these topics though for those that require additional support and/or have more limited access."</i>	None (Enabler of 'Increased general availability of all aspects of research training')
<i>"I think all these aspects are worthy of inclusion but have answered the question based on my own perceived level of knowledge I feel confident with. Statistical analysis topics should be aimed at the 'non fluff' type of stats. Possibly those types of stats that those even with minimal experience of the research process could understand. Great for journal clubs etc, to prevent glossing over the results sections of papers!! My choice as a starter would be: correlations agreement analyses parametric/ non parametric stats (basics) and how you determine what methods to use data presentation"</i>	Statistical analysis*
<i>"most of the above topics that I have not ticked were available in the research methods module of my MSc"</i>	None
<i>"I am only 4 years from retirement, so prefer to support others in research as much as I am able."</i>	None (Enabler of 'Peer support in the workplace')
<i>"It would be good for these to be readily available but at present I am not interested in carrying out any research"</i>	None
<i>"Having never done any proper "research" since my dissertation which was a literature review, I wouldn't know where to start! I've just picked a few."</i>	None
<i>"A lot of the topics are covered through MSc or similar levels of post grad education."</i>	None
<i>"I have had training on these topics through my research methods module in preparation for my Masters research project but research is not something I feel knowledgeable in or feel particularly passionate about. Hence more reinforcement would be useful in improving my confidence undertaking research in future."</i>	None (Enabler of 'Research awareness')

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<i>“already had them - but can’t have them enough / refreshers useful”</i>	None <i>(Format of delivery of ‘Refresher’ courses)</i>
<i>“Would love to get into research, but after 3 masters modules, have found it challenging to find the exact Masters which offers the best options/ fit areas of interest in one particular masters, (also in an accessible position). It is also challenging to find support for this, both financially and time wise (difficult to get study leave for full modules). Also challenging mentally to complete both MSc part time and full time job, without becoming burnt out. Not really enough opportunities for merging the two for therapists, but lots for nursing staff.”</i>	None <i>(Barrier of ‘Lack of protected time’ and ‘Lack of funding’; Enabler of ‘Creation of clinical-academic positions’)</i>
<i>“due to time constraints secondary to staffing levels and current workload - I do not feel I could take on any additional work”</i>	None
<i>“Any training would be beneficial. However the opportunity to network and learn about projects elsewhere that it might be possible to be part of would be of great interest.”</i>	None <i>(Enabler of ‘Networking and collaboration’)</i>
<i>“All of the above but those selected would be the highest priority”</i>	None

*existing response option in original question

E2. Free-text comments for 'Barriers and enablers to research engagement'

Additional free-text comments that respondents provided in response to identifying barriers and enablers to physiotherapy engagement in critical care research, and further themes identified from them, are summarised in Table E2.

Lack of protected time and funding were emphasised as barriers, in keeping with the high response levels (82.1% and 66.0% respectively) to those specific response options in the main question. Lack of support from senior management also featured strongly in comments, again a barrier echoed from the existing response options.

New themes identified in the free text comments could be divided into two categories:

- i) Profile of research within the physiotherapy profession including issues such as:
 - a. a lack of research 'culture' within physiotherapy,
 - b. a lack of integration of research within clinical roles,
 - c. a lack of defined job specification for those whose clinicians whose roles involve a research component e.g. the proportion of time assigned for research.
- ii) Profile of physiotherapists within the research community:
 - a. Lack of physiotherapy-specific research posts
 - b. Research posts being advertised to nurses specifically, rather than the wider MDT

With regard enablers to physiotherapy engagement in research, free text comments often centred on removal of barriers i.e. more protected time, greater funding rather than 'new' strategies per se. There was enthusiasm for the combined role of clinical academics, and suggestions that opportunities to be involved with, but not necessarily lead, research would be valuable.

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Table E2. Analysis of free-text comments regarding barriers and enablers to physiotherapy engagement in critical care research

Qualitative comment	Theme
BARRIERS	
<i>"I am a band 5 who has never been on critical care before so I am spending all my time learning the area and would have no time for research"</i>	Need to prioritise acquisition of clinical skills for junior staff
<i>"The perception that this is difficult to achieve with patient caseload, rotational staff teaching with current resources"</i>	Lack of protected time*
<i>"Carry out audits and service development need direction with regards writing up for publication/conference presentation"</i>	Insufficient skill set*
<i>"supportive boss but all about time management with not enough staff"</i>	Lack of protected time* Lack of staffing
<i>"Most critical care research is via big studies that involve nurse participation not therapies. Since I qualified 20 years ago, I can't think of any research opportunities involving therapies in our Trust. It all seems to be Consultant and Nurse participation. There is probably good reasons for this ? due to the huge amount of variables or jobs available in research. On my Critical care unit, the there is a specific team of 2 nurses who are employed to collect data and enrol into studies. They have the opportunity to write or be co-writers in studies"</i>	No/minimal opportunities for PT to be involved with research
<i>"Undertook my MSc a long time ago - graduated 2005 after many years struggling to undertake each component with no support and minimal funding. Since then, staffing pressures and changing roles have meant that no further research activities have been undertaken. I do think that the current climate is now much more positive towards research, but I suppose I now feel I have de-skilled and lost confidence in myself in this respect. Funding is also a major issue."</i>	Lack of support from senior staff/management* Lack of protected time* Insufficient skill set* (need for refresher courses) Lack of funding* Lack of staffing
<i>"No specific research posts - impossible to be a clinician, manager and educator plus a researcher. Unfortunately research is not a priority when you are not employed to do research".</i>	Lack of protected time* Lack of research posts
<i>"Only funding streams in our trust are currently through the NIHR and rely on backfill which then limits ability to apply. Also then pushed to follow career pathway of NIHR which may not be for everybody. Limited other options to access funding to complete research as part of clinical role and above options take you away from clinical practice. Also limited funding / study leave support to embark on a masters".</i>	Lack of funding* Lack of diversity in funding stream Lack of support from senior staff/management* Lack of integration of research in role

<i>"Lack of time to complete research on top of clinical case load. "</i>	Lack of protected time*
<i>"Clinical priorities are paramount. Poor understanding of the benefits of physiotherapist involvement in research at a departmental managerial level. No push for publications/ posters etc. Research pathway not integrated into job roles (i.e. no dedicated time although research priorities in job description). Reluctance to support applications - even when funding is available because there is perceived difficulty in getting backfill. "</i>	Lack of protected time* Lack of support from senior staff/management* Lack of recognition for PT role in research Lack of integration of research in role
<i>"Although I have carried out research and am currently involved in a qualitative project I find it difficult to keep my skills updated and the opportunities for involvement in projects is not easy to access."</i>	Unsure what opportunities are available and/or unsure who to approach to find out* Difficult to maintain skills
<i>"No previous experience to research within clinical field therefore confidence and knowledge biggest personal barriers"</i>	Lack of experience* Lack of confidence*
<i>"This research needs to be set up and encouraged by senior therapists and clinical specialists and then filtered down. If this is not happening at your area of work then it's very difficult for rotational staff to be involved"</i>	Lack of structure/culture for research in PT departments
<i>"Above ticked boxes refer to own personal insufficient skill set/experience/knowledge/confidence, with support from seniors currently I am able to take part in research and develop on these. Due to the dynamic nature of critical care it can be difficult to maintain protected time to complete research/project related work. "</i>	Lack of protected time*
<i>"Within my organisation there is a lack of role model or leadership in research. None of our Clinical Specialists/ Leads (including those from outside of Critical Care) have ever been involved in research and many do not even have a Masters. There is a lack of research culture within my Therapies Department and therefore no one to set a benchmark or to guide others. Also, research is time consuming and funding just isn't there. "</i>	Lack of structure/culture for research in PT departments Lack of protected time* Lack of funding*
<i>"Lack of protected time is the main problem. Even if research responsibilities are part of a JD, there is no system to allow protected time (e.g. research PAs as per Drs job plans). In addition the funding does not necessarily cover clinical grades >8a, which tend to have research written in to a JD. Research opportunities tend to be as part of academic qualifications (MSc/MRes/MPhil/PhD) or discrete projects embedded within academic career pathways (Fellowships etc). It feels as though there is little real opportunity to combine clinical and research activity within a clinical career pathway, whereby research physiotherapist posts or research PAs are embedded as part of clinical services (as is the case for research nurses or Drs). It seems to me that physiotherapists are faced with one of two choices a clinical career or and academic career. Funding and career pathways for physiotherapists need to be reviewed to allow physiotherapists to continue to practice clinically with research embedded as part of a clinical service. Ultimately, we are at risk off siphoning off skilled clinicians in to academia or limiting the opportunity for those with newly developed (through the existing</i>	Lack of protected time* Lack of funding* Lack of integration of research in role

<i>NIHR opportunities) or with established research skills to apply those skills within clinical services. Either way the concept of research embedded in frontline services and led by frontline staff is hard to realise for Physiotherapists"</i>	
<i>"lack of time and motivation due to poor staffing levels and current workload"</i>	Lack of protected time* Short staffing
<i>"Despite an MSc in Advanced Practice, and performing extended roles, I have never been able to negotiate any extra banding. I am reluctant to keep extending my skills when it is clear there will be no extra remuneration or opportunities for higher grade. I shouldn't be performing band 8 roles for band 7 salary"</i>	Lack of financial incentives/reward for extended skills
<i>"I will be moving back to my post in critical care and would be very keen to carry out research into prehab for our OG pts but am having difficulty knowing where to start who to approach. Have a wee team who are keen to assist but don't know how to take it forward"</i>	Unsure what opportunities are available and/or unsure who to approach to find out* Lack of experience*
<i>"There is a definite lack of support for research or the importance of research even though this could take the form of audits and service evaluation. No time however is available for these things so this would have to be undertaken in our own time. I am also rotational so 9 months does not allow time to develop projects and ideas so for me lack of static posts within critical care/career progression is a particular barrier. There is research happening within the critical care unit but this is medical focused and there are no physios involved only research nurses."</i>	Lack of support from senior staff /management* Clinical rotations too short to allow involvement* Lack of recognition for PT role in research Lack of structure/culture for research in PT departments
<i>"In our current situation the clinical caseload takes priority over all 'non-essential activities' and sadly research is viewed as non-essential"</i>	Lack of protected time*
ENABLERS	
<i>"I think one of the issues is the complexity of carrying out research in this area. I think clinical staff should be encouraged to do more service improvement initiatives and publish their findings. Training on this would be really useful and potentially more applicable in many roles."</i>	Increased access to research training*
<i>"More of a profile, highlighting therapists' knowledge and skills in research. More protected time or secondment time. Time to write review and research interventions. Post grad courses on how to get your foot in the door how to be recognised, how to link and network and understand the statistical jargon."</i>	Need to increase PT research profile Need for protected time Increased access to research training
<i>"Nearly all of the above for me. Getting some into practice, without established research units and staffing being the way it is will be a significant challenge (e.g. rotational objectives). Would be good though!"</i>	BARRIERS: Poor staffing, clinical rotations too short to allow involvement*, lack of structure/culture for research in PT

	departments
<i>"Time to participate"</i>	Need for protected time
<i>"Support from physio managers re staffing and time. We are already understaffed for 5 days but providing a 6-day service - can't fit any more in the week."</i>	Need for protected time Need for improved staffing
<i>"The only Physios I know who do research in critical care are 'research physios', I think that by developing combined clinical-academic roles it would help more staff to appreciate that being involved in research is achievable within their current role."</i>	Creation of combined clinical-academic positions*
<i>"Multicentre studies with lead from external researcher from within a culture and structure (with support) of a research centre"</i>	Opportunities to be involved with, but not lead, research
<i>"Any more support would be helpful. A large limitation is the caseload requirement. We have guidelines on WTE/bed and guidelines on access to Physiotherapy from ICS and NICE etc but there is nothing locally/nationally about protecting posts or having specific research descriptions/no. of hours within posts - this would help."</i>	Guidance on research infrastructure
<i>"Being aware of tangible outcomes/improvements from the research, being able to apply and improve practice as a result."</i>	Improved dissemination and implementation of research findings
<i>"I do not wish my comments to appear negative but as a small District General with less than 100 beds we are using our HDU as a step up facility rather than the level 3 it used to be. Our staffing levels are very low and although I would have liked to be involved with research, it would always have been at the sacrifice of patients' treatments, i.e. no ring-fenced time."</i>	Barrier: lack of protected time*
<i>"I feel that mostly critical care colleagues value physiotherapists and their contribution to research within units, however, I don't feel they have an appreciation of the requirement of PT departments / directorates to develop and deliver their own research strategies and agendas, both professionally and to meet organisational objectives. This may then create tension in terms of priority and support for physiotherapy led research within the critical care setting, with competing priorities."</i>	New barrier theme: lack of structure/culture for research in PT departments
<i>"Networks are key and the opportunity to link in/join networks should be simple and widely advertised."</i>	National PT network to link research-active critical care physiotherapists*
<i>"I have great support from ICU consultants. My concern is if I step out into a research post I am not guaranteed that I will get my old post back when the research/ secondment is finished"</i>	Greater support from Critical Care colleagues e.g. intensivists* New barrier theme: lack of job stability in research
<i>"Would love a clinical-academic position!"</i>	Creation of combined clinical-academic positions*
<i>"I think that greater information about local physio studies would then increase confidence to be able to take this experience back to our own hospitals. Within large physiotherapy studies whether it would be possible to spend a day with</i>	Greater information about local critical care physiotherapy studies*

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<i>the research teams to get an idea of what goes on etc?"</i>	Opportunities for visits to research teams
<i>"Our intensivists are very supportive of research and audit but from a therapies point of view our clinical caseload could not be impacted upon meaning the majority of training/research would have to be in own time"</i>	Greater support from Critical Care colleagues e.g. intensivists* Barrier: lack of protected time*

*existing response option in original question. Abbreviations: PT = physiotherapy

For peer review only

E3. Free-text comments regarding other research opportunities and any other aspect of the survey

Enthusiasm about involvement across research activities was expressed (Table E3), with several participants expressing that they wanted to be involved with 'anything'. There were also a few suggestions that small steps towards research involvement might be useful – such as how to support others in research and support to be a co-investigator rather than leading on a project. Analysis of overall comments from respondents regarding any aspect of the survey are presented in Table E4.

For peer review only

Table E3. Analysis of free-text comments regarding other research activities to engage with

Qualitative comment	Theme
<i>"already happily/actively involved"</i>	Already involved
<i>"I'm already involved with all of the above"</i>	Already involved
<i>"I would like to get involved with any research opportunities"</i>	Anything
<i>"Not applicable as I am currently in a full time research position"</i>	Already involved
<i>"I am already involved in these activities but also interested in collaborations"</i>	Already involved Collaborations
<i>"Time to think about research"</i>	Protected time
<i>"I would be happy to be involved in the intervention part of a research project"</i>	Delivering interventions
<i>"Already involved"</i>	Already involved
<i>"Due to barriers don't think I have the capacity to be involved"</i>	None – too many barriers
<i>"Any Physiotherapy relevant research!!! "</i>	Anything
<i>"already research active"</i>	Already involved
<i>" Any opportunity welcomed"</i>	Anything
<i>"I am heading towards the end of my career and the constant staff shortage and increase in Mandatory training for staff means that any involvement in research would be impossible"</i>	None – too many barriers
<i>"Supporting others interested in research"</i>	Supportive role for others
<i>"I might be interested in research if I had a mentor or guidance. Even to be a co-author or co-researcher and not necessarily lead a research project myself. If I had more confidence in my abilities and more support perhaps it would be something I could do in future. I have some experience in research having completed a Masters project but I would hesitate to start a big research project on my own"</i>	Support to be a co-investigator
<i>"I suppose a step back: idea development - with like-minded colleagues, would like to do something PT specific, say rehab effects on VV ECMO, we need multi sites"</i>	National physiotherapy network to link research-active physiotherapists*
<i>"I have the skills to do those research tasks in which I already participate."</i>	Already involved
<i>"Any opportunities would be welcomed. Also chance to be part of projects going on elsewhere in the area if possible. "</i>	Anything Greater information about local critical care studies*

Table E4. Analysis of free-text comments regarding any other aspect of the survey

Qualitative comment	Theme
<i>"ICU Physios generally leave ICU as they get older as it's a very physically demanding role - you don't see many ICU fully clinical physios beyond the age of 40. However very few go into research roles, they tend to leave to community jobs or into management. It would be great to influence those in senior ICU roles to be encouraged to take a more active involvement in research as they are clinicians with a wealth of experience. Also a lot of ICU clinical research roles are advertised as nursing roles"</i>	Opportunities for less physically able/older PTs
<i>"We need more of a profile, we are seen as sputum managers and yet our knowledge in anatomy and physiology, rehabilitation, critical illness polymyoneuropathy, neurology, orthopaedics, medical, surgical is often overlooked. In our Trust all our on-call staff rate the critical care unit as a particularly unfriendly place to work. The cultures and perceptions of our role as therapies needs a revamp to be able to include us more in research and development. I would guess we are all keen, just disillusioned by the lack of knowledge and respect critical care staff have regarding therapies and their skills."</i>	Need to increase PT research profile lack of structure/culture for research in physiotherapy departments
<i>"The PT career pathway needs to be developed like the doctors - they have research/clinical pathways which give the research fellows time to devote their efforts into research and delivery of research finding. PT's on the shop floor can't do that - we are stretched enough and research takes a long time. I have tried and failed"</i>	Need to increase PT research profile Lack of structure/culture for research in physiotherapy departments
<i>"Protected time is one of the issues, and guidance or awareness of how to structure research. Identification of support systems would be extremely beneficial."</i>	Lack of protected time* National physiotherapy network to link research-active critical care physiotherapists* Insufficient skill set*
<i>"My research is currently related to simulation on on-call training which does involve critical care patients - it is not necessarily specific purely to critical care patients. As research is written into my job description I am in a position to allocate time to it. I was empowered to protect time - I think all 8a JDs should specifically have an element of research documented in order to empower people to take time in their allocated work time."</i>	Benefit of clear research allocation in job role. Need for role models
<i>"As the only static PT on critical care in a part time capacity it is difficult to initiate & complete research. My aim is to complete an MSc module as a starting point. I currently undertake Quality Improvement projects / audit however have not undertaken an independent research study & would enjoy working with others at local hospitals to increase confidence to be able to achieve this."</i>	Lack of protected time* Increased access to research training* Greater information about local critical care studies* National physiotherapy network to link of research-active critical care physiotherapists*
<i>"Support from critical care colleagues and Intensivists is strong as there is already an established critical care research profile and often they are keen for physiotherapists to be involved. However, time constraints and clinical priorities are often the main barriers"</i>	National physiotherapy network to link of research-active critical care

<i>It would also be very useful to have a database of research active critical care PTs to encourage peer support and collaboration."</i>	physiotherapists* Lack of protected time*
<i>"The research culture within critical care physiotherapy teams varies greatly between trusts and clinical areas. It is extremely difficult within my trust to get any protected time to undertake research."</i>	Lack of protected time*
<i>"Time spent towards research is currently limited towards service development projects which lead onto potential abstract submission. In the current climate there does not seem to be enough time to be able to dedicate to going the extra mile with a full research project and currently service development projects are a stretch which is a shame. We aim to have service development/research as a part of the teams objectives to keep things moving forwards but these are tending to take longer to achieve due to staffing shortages and clinical pressures"</i>	Lack of protected time* Lack of staffing
<i>"At this moment in time, I am not interested in participating in research due to other large projects at work and young family at home. I may be in the future. I think having research skills are useful for staff (e.g. critical appraisal, proposal writing, writing up projects) in order to conduct audits and service improvement. I see that staff who have done masters level study are more inclined to lead and participate in service improvement at a physio department / team and at a trust level."</i>	Lifestyle aspects and broader value of research-trained staff in leadership roles etc
<i>"As with everything there is not enough hours in the day to get clinical work done let alone the management service development aspect of job role so being able to even think about doing an research is so far down the priority level it just doesn't get any thought. This in conjunction with not knowing what can be done or how to go about it is a non-starter. "</i>	Lack of protected time* Lack of prioritisation of research Lack of skills*
<i>"I feel my main barriers to research have been: Lack of expertise Lack of dedicated time"</i>	Lack of skills* Lack of protected time*
<i>"The biggest barrier is that-Lack of clear career/ research/professional pathway for our profession eg Drs have a clear professional/ training career pathway which is well supported and resourced!! "</i>	Lack of structure/culture for research in physiotherapy departments
<i>"Our Unit involved in PRISM, BREATHE, LEOPARDS - anaesthetic lead with dedicated Research nurse. No time within my role to undertake Physio research currently. "</i>	Lack of protected time*
<i>"We need to raise the profile of physiotherapy through research. I have lots of ideas but have been unable to carry them through due to some of the reasons listed above, and now my consultants are moving on with the ideas"</i>	Need to increase PT research profile
<i>"Would like to be involved in research but haven't considered it an option previously. Would be good to see secondment project opportunities or protected research time with clinical hours backfilled"</i>	Lack of structure/culture for research in physiotherapy departments Need for protected time* WITH backfill Creation of secondment opportunities into research teams*
<i>"I think this is an excellent idea. There are untapped resources in hospitals outside of the major cities which could add to the weight of evidence of our worth in critical care. We just need the confidence and time to go out and capture it!"</i>	Lack of confidence*

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Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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The authors declare they have no competing interests

AUTHOR CONTRIBUTIONS

BC conceived the study, developed and conducted the survey, completed data analysis and interpretation and drafted, revised and agreed the final manuscript version for submission. LA contributed to data entry, analysis and interpretation. MS contributed to survey development. NP contributed to study design, survey development and data interpretation. PD contributed to survey development and data interpretation. All authors contributed to manuscript revision and approved the final version for submission. BC acts as the guarantor for the intellectual integrity of the data.

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DATA SHARING

All data pertaining to this study are reported in this manuscript.

ABSTRACT

Objective

To characterise the research profile of UK critical care physiotherapists including experience, training needs, barriers and enablers to engagement in critical care research. ‘Research’ was defined broadly to encompass activities related to quantitative and qualitative studies, service evaluations, clinical audit and quality improvements.

Design

Closed-question online survey, with optional free-text responses.

Setting

UK critical care community

Participants

UK critical care physiotherapists, regardless of clinical grade or existing research experience

Results

Two-hundred and sixty-eight eligible survey responses were received during the twelve-week study period (21 incomplete, 7.8%). Respondents were based in university-affiliated (n=133, 49.6%) and district general (n=111, 41.4%) hospitals, and generally of senior clinical grade. Nearly two-thirds had postgraduate qualifications at Master’s level or above (n=163, 60.8%). Seven had a doctoral level qualification. Respondents reported a range of research experience, predominantly data acquisition (n=144, 53.7%) and protocol development (n=119, 44.4%). Perceived research training needs were prevalent, including topics of research methods, critical literature appraisal, protocol development and statistical analysis (each reported by ≥50% respondents). Multiple formats for delivery of future research training were identified. Major barriers to research engagement included lack of protected time (n=220, 82.1%), funding (n=177, 66.0%), and perceived experience (n=151, 56.3%). Barriers were conceptually categorised into capability, opportunity and motivation themes. Key enabling strategies centred on greater information provision about clinical research opportunities, access to research training, secondment roles, and professional networks.

Conclusions

UK critical care physiotherapists are skilled, experienced and motivated to participate in research, including pursuing defined academic research pathways. Nonetheless wide-ranging training needs and notable barriers preclude further involvement. Strategies to harness the unique skills of this profession to enhance the quality, quantity and scope of critical care research, benefiting from a multi-professional national clinical research network, are required.

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ARTICLE SUMMARY

Strengths and limitations of this study

- Critical care is a complex specialty by nature requiring a multi-professional and research-enabled workforce to maximise research planning and delivery for optimum patient benefit
- This is the first survey to detail the research profile of UK critical care physiotherapists to assist in building research capacity within the critical care workforce
- Barriers and enablers to engagement of critical care physiotherapists in research have been identified to support development of strategies to enhance future involvement
- Strengths of study methods include sustained use of multiple and diverse routes of survey dissemination, ease and speed of online completion, and potential for replicability
- Potential limitations include a profession-specific target population, lack of known denominator to determine accurate response level, and predominance of clinician respondents over those from academic institutions

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INTRODUCTION

Critical Care is an identified specialty therapy arena within the UK’s National Institute for Health Research (NIHR) (<https://www.nihr.ac.uk/nihr-in-your-area/critical-care/>). National and local Clinical Research Network (CRN) infrastructure is synchronised to provide oversight and logistical support enabling high quality conduct and delivery of the NIHR research portfolio (<http://www.nihr.ac.uk/research-and-impact/nihr-clinical-research-network-portfolio/>). Currently 96% of NHS England’s intensive care units (ICU) contribute to clinical research studies, one of the most engaged critical care research networks internationally ¹. The NIHR Critical Care National Specialty Group (CC NSG) comprises local CRN representatives who coordinate and review the national critical care clinical research portfolio. Since 2014 the CC NSG currently led by physicians, has engaged physiotherapy representation within it. This is alongside other allied health professions (AHP), including nursing and pharmacy, recognising that physiotherapists are key members of the multi-professional team contributing to achievement of its research agenda. Fostering multi-professional research workforce development and sustainability is an important mission for the CC NSG.

Developing a strategic approach to research-capacity building in allied health professions, such as physiotherapy, may be complex but is important for enhancing healthcare research across basic science, translational, service delivery and implementation ². Impact and value are seen at individual, team and clinical service levels when research roles for AHP are invested in ³. Furthermore, increasing emphasis on evidence-based practice has required greater potential and expectation for AHP assimilation of research to inform the clinical decision-making process ^{4 5}. However contributing to multi-professional research effort at scale in NHS critical care could require involvement of clinicians trained to appropriate regulatory Good Clinical Practice (GCP) standards ⁶, but who lack other formal research training or experience ⁷. Identifying research-trained physiotherapists and establishing levels of skill, competency and expertise would contribute significantly to supporting the planning and delivery of the best research for patient benefit. In addition this would facilitate and build collaborations, and raise recognition of the profession.

Intensive care medicine, as a profession, encourages exposure to clinical research at varying stages of professional training for all trainee clinicians and a smaller number choose a more structured clinical academic research training pathway ⁸. In the absence of a formal postgraduate clinical training programme for critical care physiotherapy, clinicians have empirically integrated research

commitments within existing clinical roles to acquire skills and experience, supplemented by postgraduate qualifications albeit access to these may be subject to local variability in financial and logistical support. The advent of the NIHR over the last decade has provided dedicated allied health profession pathways for pursuing a defined clinical academic career (<https://www.nihr.ac.uk/funding-and-support/funding-for-training-and-career-development/training-programmes/>). However, capturing these data at a profession-wide level is challenging with a paucity of work in this field. This survey therefore aimed to characterise the research profile of UK critical care physiotherapists, perceived training needs, and barriers to engagement in critical care research.

METHODS

Study design and ethical approval

This study involved the development of a national online survey of UK critical care physiotherapists conducted on behalf of the UK NIHR CC NSG. The survey did not require ethical approval (UK Health Research Authority⁹), and no local institutional Research & Development Department approval was necessary (Guy's and St.Thomas' NHS Foundation Trust, London, UK). Participation was voluntary and consent confirmed by accessing and completing the online survey. Inclusion of participant name was optional, known only to two of the researchers (BC, LA) and used only to facilitate follow-up of incomplete surveys. This study was conducted and reported in keeping with suggested good practice for surveys¹⁰ and adhering to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES)¹¹.

Sampling and survey population

Survey respondents included any UK critical care physiotherapist, regardless of existing research experience or clinical grade and employed in adult or paediatric subspecialties. At present there is no formal database of such clinicians, and we adopted a pragmatic approach to enable responses from as many clinicians as possible within a defined timeframe who aligned themselves as a physiotherapist specialising in critical care. Responses from non-physiotherapists were excluded.

Survey development

A closed-question survey was designed by the authors (Online Supplement, Section E1). The survey was modelled and expanded upon a recently published survey of intensive care medicine trainees with a similar aim⁷, with additional content considered relevant by the authors for addressing the current study aims. Item generation and reduction were completed internally by the review authors

during survey design which also allowed for confirmation of both content and construct validity¹². The draft survey was developed offline; clinical sensibility and face validity testing were conducted through piloting the survey with 6 critical care physiotherapists of varying clinical seniority grade and existing research experience to refine the quality and interpretation of questions¹³. Feedback was requested on i) comprehension and interpretation of questions, ii) flow, salience, acceptability and ease of completion, iii) identification of missing items requiring questioning, or response options to existing questions, iv) time required for survey completion¹². Comments from this process resulted in clarification of seven questions and additional responses added to six questions. On average the survey was reported to take no more than 10mins to complete. Once transferred to the online electronic format, the final survey was tested by one further independent physiotherapist.

The final survey consisted of four sections; i) Background (demographics), ii) Research Experience, iii) Research Training Options, iv) Barriers to Research Engagement. ‘Research’ encompassed activities related to quantitative studies, qualitative studies, service evaluations, clinical audit and quality improvements. If completed in full, the survey totalled 25 questions. The majority of questions were closed-question nominal format involving response selection from multiple non-ranked options, nor were respondents asked to mark their response in terms of perceived importance or grading. Where applicable, questions always contained an ‘Other’ option to enable free-text comments from respondents. Question layout followed recommended approaches e.g. categorised into sub-sections, numbered and with response options appearing on separate lines, with multiple-item screens and short-entry boxes¹². Furthermore electronic functionality to enhance completion was optimised e.g. filtering of questions according to ‘Yes/No’ response, and limiting progression until specific answers provided.

Survey Distribution

Survey distribution occurred for an *a priori* defined 12week period, with an additional 4week follow-up period to contact respondents with missing data. A personalised opening cover letter was included and the lead author’s contact details were circulated on the survey link to respond to any individual queries regarding survey completion. An electronic link enabled respondents to access the online survey and a variety of strategies to access potential respondents were employed including: the NIHR CC NSG and CRN distribution lists (members of the NIHR CC NSG, and representatives of all NHS Trusts within each of the local CRN areas respectively; individuals on these lists were requested to cascade the survey to their local critical care physiotherapy colleagues); advertising on the NIHR CC NSG website; the UK Critical Care Research Group distribution list (any

clinician who has attended the national meeting of this Group in the last three years); clinical professional specialist interest group websites and membership newsletters; local networks of clinical colleagues; social media links; a national UK critical care course for physiotherapists; and snowballing. Regular re-circulation of the survey link was conducted via these routes during the 12-week period. At the end, incomplete survey responses were identified. Where respondents left contact details attempts were made to request missing data. Response data were recorded electronically in bespoke survey software (Survey Monkey®, San Mateo, CA, US, <https://www.surveymonkey.net/>) and then exported into Microsoft Excel format (Microsoft Office 2013, Microsoft Corp, Redmond, WA, US) for analysis.

Patient and Public Involvement

No patients or public were involved in any aspect of this study as it focused on development of a clinician-targeted survey to determine research engagement.

Data analysis

Quantitative data were analysed descriptively using counts and percentages. Ordinal data were reported as medians (inter-quartile range, IQR).. Qualitative comments were analysed for recurrent themes using free text analysis¹⁴ by one researcher (LA) and reviewed by the primary author (BC), removing any potentially identifiable text in advance. One researcher (BC) additionally mapped results to a behaviour change framework involving three essential interacting conditions (capability, opportunity, motivation) that modify and influence the behaviour; the COM-B system¹⁵. In this study the 'behaviour' was critical care physiotherapy research engagement, and findings were best placed under the sub-headings of each condition (Capability - physical and psychological; Opportunity – Social and Physical; Motivation – Automatic and Reflective). In the absence of a known denominator for the total number of UK critical care physiotherapists, it was not possible to set a target *a priori* response rate. Instead the overall number of responses acquired during the 12-week survey period were collated. Analyses were performed using GraphPad Prism version 7.0d (GraphPad Software, La Jolla, CA, US, www.graphpad.com).

RESULTS

Respondents

Two-hundred and seventy-one responses were received during the survey period (30th August to 22nd November 2016, with additional follow-up as aforementioned), of which 3 were excluded (n=2 duplicate, n=1 non physiotherapist), leaving 268 in the final analysed sample. Twenty-one responses

remained incomplete after attempted contact (7.8% (n=16 no contact details)). Missing data to individual questions was low, ranging 4.1-7.8%. Demographic data for the cohort are provided in Table 1. Respondents were almost equally based within University-affiliated (n=133, 49.6%) or District General (n=111, 41.4%) hospitals, although the vast majority were located in England (n=234, 87.3%). Median (IQR) clinical seniority of respondents was Band 7 (6-7) indicating a senior, specialist grade (higher bandings indicate greater seniority). Nearly two-thirds of respondents had a postgraduate qualification at Master’s level or above (including individual modules) (n=163, 60.8%), with funding provided locally in half of cases (n=132, 49.3%). Seven respondents had a doctoral level qualification.

Research experience

Two respondents did not complete this section (0.7%). Of the remaining 266 respondents, 227 (84.7%) indicated existing research experience. Frequency of involvement in types of research activity varied (median (IQR) 2 (1-3) different activities). Most commonly respondents indicated experience of participation in local/regional audits or service evaluations (n=204), with 116 respondents reporting attending a research-related course. One-hundred and twenty-nine respondents reported involvement in either multi- or single-site studies, and 76 had research publication experience (first, co-, or senior author). Ninety-one respondents had submitted a conference abstract, and 31 had completed a dedicated postgraduate research qualification.

Sixty-five respondents (24.2%) indicated current involvement in research as chief (n=13), principal (n=17) or co- (n=21) investigator or in a research physiotherapist/assistant role (n=21). Other roles included strategic positions e.g. as director of an institutional research centre. Respondents were predominantly involved in quantitative study types (randomised and non-randomised controlled trials, n=22; observational studies, n=23), but also reported methodological and review-based research (feasibility studies, n=19, systematic review, n=2, methodological study, n=1) and qualitative (n=20) research design. Survey (n=4), epidemiological (n=4) and case study, proof-of-concept and mixed methods (n=1each) research studies were also reported. The majority of studies that respondents were involved in were either publicly or self-funded (n=53, 81.5%).

Two-hundred and fifty-seven respondents (95.9%) described research activities they had previous or current experience of (Table 2). More than fifty percent had been involved with data acquisition or completion of outcome measure assessment in studies, followed by protocol development. The vast majority of respondents had no allocated time for research in their current role (n=210, 78.4%). On

average, respondents with some allocated research time ranged from between 3 days/week to full time (n=4, 1.5%), between 1 and up to 3 days/week (n=15, 5.6%), less than one day/week (n=18, 6.7%) and less than one day/month (n=9, 3.3%).

Seventy-one respondents (26.5%) had completed Good Clinical Practice (GCP) training. Of the remaining 186 respondents, 149 (55.6%) reported a lack of familiarity with what GCP involved, 27 (10.1%) reported they would like to complete GCP training but could not access it locally, 7 (2.6%) were scheduled to attend and 3 (1.1%) did not feel GCP training was necessary.

Research training needs

Respondents were asked to identify research training topics they would benefit from (Table 3). Two-hundred and fifty-one respondents (93.7%) completed this question. Most frequently reported topics included research methods, critical appraisal of literature, protocol development and statistical analysis, all identified by at least fifty percent of respondents. Least reported training topics included epidemiology, and recruitment and consent. Respondents (n=250, 93.3%) reported a variety of methods of delivery of research training topics including courses/workshops run either on a weekday (full day, n=135 (50.4%), half-day, n=62 (23.1%)), weekend (full day, n=76 (28.4%), half-day, n=37 (13.8%)) or evening (n=33, 12.3%) or via online (n=145, 54.1%). Analysis of free-text comments from respondents in relation to this question is provided in the Online Supplement (Table E1). Twenty-eight respondents (10.4%) reported they would not be interested in any research training.

Barriers and enablers to research engagement

Of respondents not currently involved in research (n=195, 72.8%), the vast majority (n=167, 85.6%) indicated they would like the opportunity. Research activities that respondents expressed interest in included data collection/recording (n=142, 53.0%); leadership and conduct of own projects (n=129, 48.1%); dissemination activities (n=114, 42.5%); data analysis and interpretation (n=109, 40.7%); writing abstracts for conference submission (n=96, 35.8%); manuscript writing for publication (n=87, 32.5%); recruitment and consenting (n=83, 31.0%); eligibility screening (n=72 26.9%).

All respondents, regardless of existing involvement in research, were asked to indicate perceived barriers to physiotherapy involvement in critical care research, and initiatives to improve this (termed 'enablers') (Table 4). Most frequently identified barriers were lack of protected time (n=220, 82.1%), lack of funding (n=177, 66.0%) and lack of experience (n=151, 56.3%). Key enablers

centred on information provision including knowledge of local critical care physiotherapy studies and around opportunities for involvement in studies. Analysis of free-text comments from respondents in relation to this question is reported in the Online Supplement (Table E2). New themes of barriers that were identified centred on the profile of research within the physiotherapy profession, and the profile of physiotherapists within the wider research community.

Qualitative data

Qualitative free-text comments from respondents regarding any aspect of the survey were analysed are summarised (Online Supplement, Tables E3 and E4). In the majority of cases comments reflected existing response options to previous survey questions e.g. mentorship to assist those commencing involvement in research, lack of protected time, the potential benefits of mentorship and peer support, or greater information provision about local critical care research studies. However these comments were considered valuable for providing an additional personal narrative to contextualise the quantitative data.

DISCUSSION

This study reports the first findings of their kind detailing characteristics of experience, training and engagement in research of the UK critical care physiotherapy workforce. The results demonstrate a skilled, experienced and motivated workforce constrained by logistical, knowledge-related and professional cultural factors. Key enablers to research engagement primarily centre on improvements in information provision around critical care physiotherapy and non-physiotherapy studies, broadening opportunities for formal research involvement, increased access to training and greater numbers of secondment opportunities into established research groups. Findings from this survey underscore the importance and value of building research capacity in the critical care physiotherapy profession ^{2 16}, and enable the prioritisation of actions to support developing and sustaining a research-enabled critical care workforce involving physiotherapy.

Significance of the findings

Research activity in UK ICUs is evidently high, as reflected by the percentage of units supporting the national research portfolio. However this does not appear commensurate with equally high levels of research involvement by physiotherapists. These survey findings suggest a potential disconnect, highlighted by the depth of detail we have captured at individual clinician level in particular around barriers to involvement, in contrast to the relatively insensitive metrics used to determine research delivery at a unit-level. Clinicians indicated a wide range of research experience that, if harnessed

and nurtured appropriately, could support future studies led by, and in collaboration with, critical care physiotherapists. In turn this could assist in maintaining and diversifying the national portfolio beyond existing levels. Critical care is by nature a complex specialty provided by a multi-professional team; consequently the best research for patient benefit is likely to arise secondary to engagement of all members of that team. These findings also mirror the international evidence base exploring AHP engagement in research^{4 17-20} supporting their generalisability and confirming consistent themes across disciplines and different healthcare jurisdictions.

To understand factors contributing to current levels of physiotherapy engagement in critical care research, results were broadly mapped to a common behavioural change model, the COM-B framework (Figure 1)¹⁵. Addressing any component of COM-B can facilitate behaviour modification; in this instance, the 'behaviour' being involvement in research. For example, major opportunity-related barriers reported by clinicians were lack of protected time and funding with clinicians attempting to incorporate research opportunity within day-to-day clinical roles. This scenario of research capacity balanced against resource restriction is not uncommon within physiotherapy^{21 22}, and may be difficult to immediately rectify with ever-increasing demands on clinical service delivery and competing priorities. That said, one enabler identified by respondents focused on awareness of available funding sources and this could be facilitated by identifying colleagues with knowledge and experience around identifying funding options for guidance. Insufficient knowledge, skills and confidence (capability) were other important barriers. Increased access to research training was a key enabler that could target this aspect. Importantly though, findings from this survey highlighted the need to consider flexible, multimodal and innovative forms of training in terms of content, design, format and delivery. One third of respondents reported that identifying key contacts with their local organisation would facilitate involvement in research. Whilst this has obvious practical benefits, it further speaks to the broader concept of requiring role models, mentors and leadership (motivation barrier) to set a template and provide guidance.

Quantitative and qualitative findings from this survey suggested a distinction between clinicians who had transitioned into a defined academic path e.g. research-specific Master's level qualifications and/or subsequent doctoral training, and those who had skill and experience (often considerable) and keenness for research involvement but who preferred to remain primarily clinical-facing; the concept of clinical academics and academic clinicians. The extent to which this concept truly exists requires further exploration amongst critical care physiotherapists, but could highlight differing approaches needed to integrate these different roles into the research community. Presence of a positive research culture (both within physiotherapy departments and ICUs), perceived value of

research by own and other professions, and the overall research profile of the physiotherapy profession were all factors identified by respondents that influenced their opportunity for involvement in research; in particular recognition from senior management and support from critical care colleagues were reported as beneficial factors. These findings echo similar themes identified from a previous survey of physiotherapy managers' of their departmental staff ²¹, and a separate observational study of physiotherapist researchers having completed PhDs ²³. In this latter study, key suggestions for improving research academic career paths included roles that allowed for clinical-research and academic-clinical combinations, securing adequate funding for physiotherapy research positions, and enhancing collaboration between academic and clinical researchers ²³. Certainly fostering partnerships between Universities and NHS institutions in the UK, in particular via Academic Health Sciences Centres, for honorary academic appointments could be valuable for accessing academic support and mentorship for clinicians. Furthermore improving patient healthcare through embedding research into routine clinical care is key for the NIHR, in line with NHS Constitution for England principles ²⁴ – this ethos provides support to those aforementioned clinicians wanting greater research exposure whilst remaining in direct clinical positions.

Moving forwards, these survey findings help to identify strategies to support greater involvement of critical care physiotherapists in research; indeed the impact of these findings could be more wide-reaching in principle relating to other allied health professions. Improving information provision around existing studies and secondment opportunities for involvement could be achieved through local and national research-based infrastructure; encouraging links between existing professional organisations to combine resources and promote funding and training opportunities; considering alternative models of working to incorporate research time into clinical job descriptions may be required, and engaging managers proactively to recognise the value of research-trained physiotherapists embedded in clinical services; and profiling positive examples of success to increase awareness amongst the multi-professional critical care team about the benefit of physiotherapy involvement in studies. In addition, developing peer-support networks akin to that which has been established by intensive care medicine trainees (<http://www.rafrainees.com/>), may be valuable for sharing experiential learning, offering access to mentors, and collaborative working, and the newly formed UK AHP/Nursing Network for Critical Care Research is an example of this. Finally, collaborating with other critical care professions to deliver generic research methods training would not only ensure efficient utilisation of resources and personnel, but likely broaden the depth and breadth of the overall learning experience and foster inter-professional links. Building research skills and training into physiotherapy-specific competencies would mirror the approach taken in other

medical specialities. Key to supporting these initiatives is the recent publication of the NIHR CRN Allied Health Professionals Strategy that sets out five strategic goals to realise the potential of AHP contributing to the conduct and delivery of NIHR research across the specialties (available at <https://www.nihr.ac.uk/our-faculty/clinical-research-staff/allied-health-professionals.htm>), and significantly highlights this area.

Critique of the method

These novel data from both quantitative and qualitative analysis highlight the research profile of UK critical care physiotherapists. Whilst the target population of respondents was profession-specific, which could limit generalisability, this study echoes the process and outcomes of a recent survey of UK intensive care medicine trainees which sought to understand how to improve trainee access to critical care research opportunities⁷. Furthermore, the current survey was in itself non-profession focused i.e. no questions were designed or phrased specifically related to physiotherapy per se. It could therefore easily be replicated across other allied health and nursing roles with little, if any, modification to generate larger volumes of similar characteristic data.

Rigorous methods for survey development were adopted including design and formatting strategies to enhance user-acceptability and completion, and processes to maximise robustness e.g. ensuring content, construct and face validity. The focus of the survey was limited to acquiring descriptive information to provide a baseline phenotype of the current state of critical care physiotherapy engagement in research. Nonetheless further psychometric testing of the survey e.g. formal cognitive interviewing may have been methodologically valuable in its development²⁵. In the future, more detailed and purpose-designed studies to enable deeper exploration of this area may also be valuable, which would facilitate inferential analyses,

A notable strength of this study is the use of sustained, multiple, and diverse routes of dissemination for maximising awareness and completion amongst the target population during the survey period, spanning clinical, research and professional remits. This approach was essential given the absence of a formal central registry for identifying potential respondents. Nonetheless lack of an accurate respondent denominator precludes determining an overall response level, and consequently may challenge the representativeness of findings. That said, the response level is more than four times the number of physiotherapy members in the UK Intensive Care Society (n=60)²⁶, and is estimated to reflect critical care membership within the Association of Chartered Physiotherapists in Respiratory Care (Personal Communication; 2017 membership 1050, assuming equal distribution

across the four core areas of critical care, surgery, long-term conditions and paediatrics (<http://www.acprc.org.uk/>). Our individual national response levels also closely align with national population levels suggesting the findings reflect the geographical spread of UK critical care physiotherapists (<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/latest>). However in the future it may be beneficial to explore any potential differences between nations in the context of specific detail of critical care service provision. It is possible that missing data to questions, whilst overall very low, may have been skewed by the relative proportions of responses which should be considered when interpreting results e.g. defining future training needs. Furthermore all available opportunities for targeting respondents were adopted, and the achieved response level has provided adequate data to answer the original study aims with consistent themes arising from the data. However as with all surveys there is potential for inherent self-selection and response bias and there are no formal means of assessing degree of non-response and/or any differences between characteristics of responders versus non-responders^{27 28}.

Choice of online survey completion via electronic link versus alternative routes such as postal, was also pragmatic in light of lack of contact details for potential respondents. A four week follow-up period following official closure of the survey was included to contact respondents to obtain missing data, a challenge to all survey studies regardless of interface, and within the current sample the overall proportion of missing data was low (<8%). This survey primarily targeted clinical rather than academic critical care physiotherapists albeit responses from these individuals were not specifically excluded but nor were avenues of survey promotion or dissemination via academic organisational routes pursued; ultimately a very small proportion of respondents indicated they were based in University settings. In the future specifically targeting/including academic clinicians may provide valuable information as their experience of engagement in critical care research may differ due to context and environment which may have been missed in the current results. That said, similar challenges around determining an accurate denominator for these individuals may still exist.

Importantly the definition of a ‘critical care physiotherapist’ was open to individual interpretation to maximise volume and breadth of response level. This was not restricted to any acuity of healthcare setting recognising that research with critically ill patients may transition clinical environments, be irrespective of levels of care²⁹, and indeed continue beyond the acute hospitalisation period. However it is acknowledged that in the latter stages of recovery physiotherapists from other

specialist areas may become involved in delivery of services to post critical illness patients, and they may not have responded to a survey targeted at 'critical care' physiotherapists. In addition, physiotherapists in both the adult and paediatric sector were eligible to respond and from all clinical grades of seniority to maximise representativeness. Furthermore, a broader definition of the term 'research' was adopted to encompass clinical audit, service evaluations and quality improvements to capture data on all activities that clinicians may be involved in and utilise broad research-based skills. Again, this approach helps to consider translation of the findings to other non-physiotherapy professions where involvement in this range of activities may occur. Finally, as with all survey data, the findings are relative to the survey period and it is acknowledged that additional numbers of clinicians may have attained postgraduate qualifications or involvement in research in the interim period from survey conduct to publication of results.

CONCLUSION

UK critical care physiotherapists have skill and experience in many aspects of research. A large number have postgraduate qualifications, including those indicating a defined academic research path. Nonetheless wide-ranging training needs and notable barriers preclude further involvement. These data may help inform approaches to harness the unique skills of this profession to enhance the quality, quantity and scope of critical care clinical research to maximize patient benefit, within a multi-professional national clinical research network, and may have international applicability.

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TABLES**Table 1.** Demographic data for survey respondents.

Characteristic	Respondents (n=268)
Employment organisation	
University-affiliated hospital	133 (49.6)
District general hospital	111 (41.4)
Other – Specialist centre	10 (3.7)
– Unclassified	8 (3.0)
– University	5 (1.9)
– Community	1 (0.4)
Location	
England	234 (87.3)
Scotland	16 (6.0)
Wales	12 (4.5)
Northern Ireland	6 (2.2)
Grade of seniority [^]	
5	10 (3.7)
6	73 (27.2)
7	127 (47.4)
8a	36 (13.4)
8b	4 (1.5)
Other (not specified)	5 (1.9)
Not given	13 (4.9)
Postgraduate qualification [#]	
Master of Science	80 (29.9)
Master's level module	66 (24.6)
PG Certificate	37 (13.8)
PG Diploma	21 (7.8)
Master of Research	10 (3.7)
None	9 (3.4)
PhD	7 (2.6)
Professional Doctorate	0
Other*	35 (13.1)
Funding source [#]	
Local organisation	132 (49.3)
Self-funded	73 (27.2)

Established funding pathway	29 (10.8)
Professional body	15 (5.6)
Other~	4 (1.5)

Data reported as n (%). ^ indicated UK Agenda for Change pay structure for allied health professionals; higher numbers (and consecutive letters) indicate more senior, specialist clinical grades. * indicates counts representing frequency of occurrence where multiple options could be selected, and totals will exceed 268 (100%). * 'Other' categories include: Currently undertaking a postgraduate qualification (MSc, PhD, MRes), n=14; Miscellaneous mix, n=7; Leadership/Education qualification, n=6; Prescribing qualification, n=3; Pre-registration MSc, n=3. ~ 'Other' categories include: Charity, n=3; Specialist Interest Group, n=1

Table 2. Previous or current research activity experience of respondents

Research activity	Responses*
Data acquisition/completion of outcomes measures or assessments	144 (53.7)
Protocol development	119 (44.4)
Recruitment and consent	82 (30.6)
Statistical analysis and data interpretation	81 (30.2)
Intervention delivery	75 (28.0)
Database management	69 (26.8)
Patient and public involvement and engagement	68 (25.4)
Ethics/Research and Development approvals application process	64 (23.9)
Manuscript preparation/writing	63 (23.5)
Screening for eligibility	60 (22.4)
Completion of study case report forms	46 (17.2)
None	17 (6.3)

* Data reported as n (%). N=268, n=257 respondents, n=11 missing data. Multiple options permitted per respondent

Table 3. Research training needs of respondents

Research training need	Responses*
Statistical analysis	132 (49.3)
Research methods	122 (45.5)
Protocol development	121 (45.1)
Critical appraisal of literature	119 (44.4)
Applying for grant funding	101 (37.7)
Mentorship	96 (35.8)
Ethics/Research & Development application process	96 (35.8)
Data management	96 (35.8)
Writing a manuscript for publication	92 (34.3)
Systematic review/meta-analysis/synthesis	91 (34.0)
Applying for individual funding	85 (31.7)
Writing a scientific abstract	82 (30.6)
Research team collaboration	69 (25.7)
Recruitment and consent	45 (16.8)
Epidemiology	41 (15.3)

Data reported as n (%). N=268, n=223 respondents, n=17 missing data, n=28 reporting no research training required and not categorised

Table 4. Barriers and enablers to physiotherapy involvement in critical care research

Barrier	Responses*
Lack of protected time	220 (82.1)
Lack of funding	177 (66.0)
Lack of experience	151 (56.3)
No critical care-related research conducted in Physiotherapy Department	110 (41.0)
Lack of confidence	110 (41.0)
Insufficient skill set	97 (36.2)
Unsure what opportunities are available and/or unsure who to approach to find out	96 (35.8)
Lack of support from senior staff/management	86 (32.1)
Insufficient knowledge base	69 (25.7)
No research currently conducted in Critical Care Department	68 (25.3)
Clinical rotations too short to allow involvement	35 (13.1)
Enabler	
Greater information about local critical care physiotherapy studies	185 (69.0)
Wider advertising of opportunities for involvement	153 (57.1)
Increased access to research training	150 (56.0)
Creation of secondment positions into research teams	150 (56.0)
Greater information about local critical care studies	149 (55.6)
National physiotherapy network to link research-active critical care physiotherapists	147 (54.9)
Increased engagement at senior staff/management level	120 (44.8)
Creation of combined clinical-academic positions	114 (42.5)
Greater familiarity/understanding of available funding sources	114 (42.5)
Greater support from Critical Care colleagues e.g. intensivists	102 (37.1)

Knowledge of key contacts within local organisation	84 (31.3)
Option for including as a rotational objective	66 (24.6)

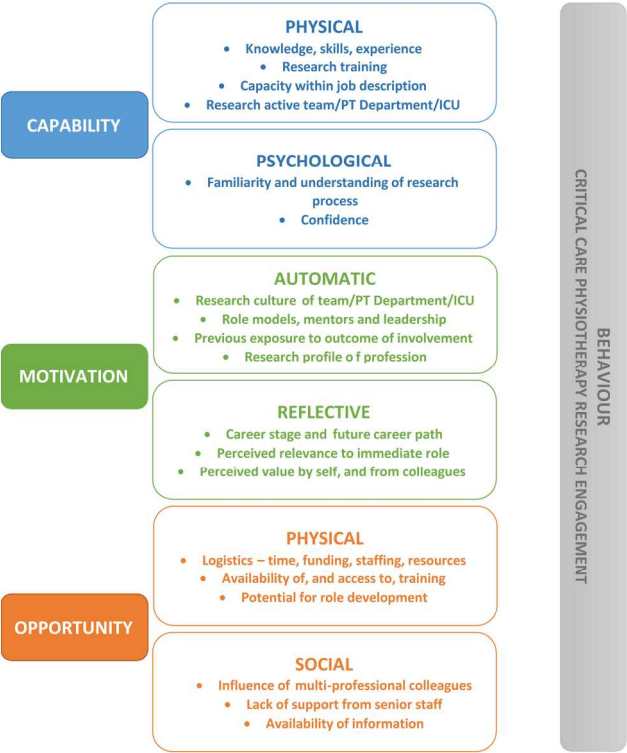
* Data reported as n (%). N=268; n=244 respondents, n=24 missing data; enablers, n=247 respondents, n=21 missing data

FIGURES

Figure 1. Influencing factors contributing to critical care physiotherapists’ involvement in research mapped to the COM-B model¹⁵

Abbreviations: PT = physiotherapy. ICU = intensive care unit

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Influencing factors contributing to critical care physiotherapists’ involvement in research mapped to the COM-B model

197x160mm (300 x 300 DPI)

Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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SUPPLEMENTAL INFORMATION

E1. Research survey

The below is a Microsoft Office Word version of the survey uploaded onto an electronic server for online completion (note formatting changes between differing interfaces).

Section 1. INTRODUCTION

You are invited to participate in this survey to describe the current research skills profile and training needs of UK critical care physiotherapists. This survey is designed for completion by **all** critical care physiotherapists, regardless of research experience to help inform our understanding of this subject. In particular the survey will collect data on postgraduate research qualifications, research experience, resources to enhance research skills and training, and perceived barriers to engagement with research.

If you have any questions relating to the survey or its completion, please contact

Dr. Bronwen Connolly at Bronwen.connolly@nhs.net.

Your participation is highly valued, and we thank you for your time. Please note that once you commence the survey you will not be able to return at a later date to complete it. Pilot testing of the survey indicates it takes approximately 10 minutes to complete – therefore please ensure you have this time available to complete the survey in its entirety.

Thankyou for your consideration and participation

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Dr. Bronwen Connolly, on behalf of the NIHR Critical Care Speciality Group

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Section 2. BACKGROUND

- 1. Participant name (optional)
- 2. Email address for future contact (optional)
- 3. Current job title (free text box)
- 4. Type of employment institution:
 - University hospital
 - DGH
- 5. Location:
 - England
 - Wales
 - Northern Ireland
 - Scotland
- 6. Current Agenda for Change grade (free text box)
- 7. How many years qualified (free text box)
- 8. How many years in current post (free text box)
- 9. Have you undertaken any of the following (tick all that apply):
 - PhD
 - Professional Doctorate
 - Master of Science
 - Master of Research
 - Master's level module (stand alone)
 - Post-graduate Diploma
 - Post-graduate Certificate
 - Other academic qualification (please specify)
- 10. Funding source:
 - Self-funded
 - Local funding
 - NIHR pathway

Other (please specify)

(if more than one award applied, please complete for most recent award and state which this is)

Section 3. RESEARCH EXPERIENCE

11. Which statement(s) best describe your existing research experience (please tick all that apply)

I have completed a dedicated postgraduate research qualification e.g. MRes, PhD

I have a first author publication

I have a co-author research publication

I have submitted/presented a conference abstract/poster/presentation

I have had active involvement in a multi-centre study e.g. recruitment, data collection

I have had active involvement in a single-centre study e.g. recruitment, data collection

I have participated in local or regional audit or service evaluation

I have attended a research-related course

None at all

Other (please comment)

12. Are you currently involved in research: YES/NO

If YES, in what capacity:

Chief Investigator of a study

Principal Investigator of a study

Co-investigator of a study

Research physiotherapist/assistant

Other (please specify)

If YES, please indicate the type of study:

Randomised controlled trial

Non-randomised controlled trial

Observational study

Feasibility study

Epidemiological study

Qualitative study

If YES, is the study commercially funded: YES/NO

13. What research activities have you previously or currently experience of:

(tick all that apply)

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- Protocol development
- Patient and public involvement in research study
- Ethics and R&D approvals application process
- Screening for eligibility
- Recruitment and consent
- Completion of case report forms
- Data acquisition/completion of outcome assessments
- Intervention delivery
- Database management
- Data analysis
- Manuscript preparation
- Other

14. Have you undertaken Good Clinical Practice training:
- Yes
 - No, I wanted to but could not access it
 - No, but I am scheduled to attend
 - No, I don't feel this is necessary
 - No, I don't know what this is
15. How much of your time is currently spent in research (report in hours/week or %WTE)
16. How is this research time funded:
- Costed as part of research study
 - Individual funding pathway e.g. NIHR
 - Established component of current clinical position
 - Unfunded, conducted during existing clinical position
 - Not funded, conducted in own time

Section 4. RESEARCH TRAINING OPTIONS

17. What research training topics/resources would you like available:
- Research methods
 - Epidemiology
 - Critical appraisal
 - Protocol development
 - Data management
 - Statistical analysis

Research team collaboration
Ethics and R&D approval processes
Writing a scientific abstract
Writing a manuscript for publication
Applying for grant funding
Applying for research agency fellowships e.g. NIHR, Health and Care Research Wales or other devolved nation-specific
Mentorship
Systematic review/meta-analysis/meta-synthesis
Consent
Other (please specify)

18. How would you like these delivered:

One day course/workshop
Half day course/workshop
Evening course/workshop
Weekday
Online
Other (please specify)

Section 5. BARRIERS TO RESEARCH ENGAGEMENT

19. If you are not currently involved in research, would you like to be (in any capacity):

YES/NO

20. Select any barriers you identify to participating in research:

Insufficient skill set
Insufficient knowledge base
Research not happening in local critical care
Unfamiliar with critical care research happening in local physiotherapy
Department
Not sure what opportunities are available
Rotations too short to complete a project
Don't know how to find out about research/who to approach
Lack of time
Lack of funding
Lack of support from senior staff/management

- 1
- 2
- 3 Lack of confidence
- 4
- 5 Lack of experience
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- 7 No barriers identified

8 21. What opportunities would you like to get involved with:

- 9
- 10 Patient screening for eligibility
- 11 Recruitment and consent
- 12
- 13 Data collection and recording
- 14
- 15 Data analysis and interpretation
- 16
- 17 Abstract writing for conference submission
- 18 Manuscript writing for publication
- 19
- 20 Poster or other presentation opportunities
- 21
- 22 Orchestrating own project (protocol development, grant preparation etc)
- 23
- 24 I am not interested in any research opportunities
- 25
- 26 Other (please specify)

27 22. What initiatives do you think may help improve physiotherapy involvement in critical care research:

- 28 Greater information about local critical care research studies
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- 30 Greater information about local critical care physiotherapy research
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- 32 Clear opportunities for involvement
- 33
- 34 Increased engagement at managerial level for undertaking research qualifications/integrating
- 35 research into existing roles
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- 37 Recognized rotational objective
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- 39 Increased access to research training opportunities
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- 41 Creation of combined clinical-academic positions
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- 43 Creation of secondment positions into research teams
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- 45 Greater familiarity with funding opportunities
- 46
- 47 Knowledge of key contacts within local organization
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- 49 National physiotherapy network to link research-active physiotherapists
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- 51 Other (please specify)

52 Please feel free to add any additional comments or suggestions regarding any aspect of this

53 questionnaire

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E2. Free-text comments for 'Research training needs'

Additional free-text comments that respondents provided in response to identifying research training needs, and additional topics from them, are summarised in Table E1. Some respondents suggested that the skills necessary to complete research were often found within clinical Masters' programmes, but there was a frequent request for refreshers and updates in research methods for those who had completed training but been unable to maintain skills. Importantly, some participants highlighted that even with training available, there needed to be support to release staff for training to prevent understaffing and clinical workloads from taking priority.

A number of free-text comments mirrored those already provided as response options to this question e.g. writing a manuscript for publication, statistical analysis. Others were identified as barriers (e.g. lack of protected time for research) or enablers (e.g. peer support in the workplace) to engagement in research that linked to comment made in response to the subsequent question.

Table E1. Analysis of free-text comments regarding research training needs

Qualitative comment	Theme
<i>"Not sure Interest would depend on activity and needs at the time the training is available. Also level of training"</i>	None
<i>"actually probably a bit of everything, I have attempted to write a paper twice, one I submitted but it got turned down, and then I gave up as it takes so much of your own time to sort."</i>	Writing a manuscript for publication*
<i>"Nobody has any time or staffing to release to research unless your job was a research job. Training in this subject is so important however, I think we all leave it to someone else who has the connections, expertise and time."</i>	None (Barrier of 'Lack of protected time')
<i>"I am fortunate to have existing experience developed across a number of these areas through my research positions to date, and have access to all training required. I think there should be availability of all these topics though for those that require additional support and/or have more limited access."</i>	None (Enabler of 'Increased general availability of all aspects of research training')
<i>"I think all these aspects are worthy of inclusion but have answered the question based on my own perceived level of knowledge I feel confident with. Statistical analysis topics should be aimed at the 'non fluff' type of stats. Possibly those types of stats that those even with minimal experience of the research process could understand. Great for journal clubs etc, to prevent glossing over the results sections of papers!! My choice as a starter would be: correlations agreement analyses parametric/ non parametric stats (basics) and how you determine what methods to use data presentation"</i>	Statistical analysis*
<i>"most of the above topics that I have not ticked were available in the research methods module of my MSc"</i>	None
<i>"I am only 4 years from retirement, so prefer to support others in research as much as I am able."</i>	None (Enabler of 'Peer support in the workplace')
<i>"It would be good for these to be readily available but at present I am not interested in carrying out any research"</i>	None
<i>"Having never done any proper "research" since my dissertation which was a literature review, I wouldn't know where to start! I've just picked a few."</i>	None
<i>"A lot of the topics are covered through MSc or similar levels of post grad education."</i>	None
<i>"I have had training on these topics through my research methods module in preparation for my Masters research project but research is not something I feel knowledgeable in or feel particularly passionate about. Hence more reinforcement would be useful in improving my confidence undertaking research in future."</i>	None (Enabler of 'Research awareness')
<i>"already had them - but can't have them enough / refreshers useful"</i>	None (Format of delivery of 'Refresher' courses)

<i>"Would love to get into research, but after 3 masters modules, have found it challenging to find the exact Masters which offers the best options/ fit areas of interest in one particular masters, (also in an accessible position). It is also challenging to find support for this, both financially and time wise (difficult to get study leave for full modules). Also challenging mentally to complete both MSc part time and full time job, without becoming burnt out. Not really enough opportunities for merging the two for therapists, but lots for nursing staff."</i>	None (Barrier of 'Lack of protected time' and 'Lack of funding'; Enabler of 'Creation of clinical-academic positions')
<i>"due to time constraints secondary to staffing levels and current workload - I do not feel I could take on any additional work"</i>	None
<i>"Any training would be beneficial. However the opportunity to network and learn about projects elsewhere that it might be possible to be part of would be of great interest."</i>	None (Enabler of 'Networking and collaboration')
<i>"All of the above but those selected would be the highest priority"</i>	None

*existing response option in original question

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E2. Free-text comments for ‘Barriers and enablers to research engagement’

Additional free-text comments that respondents provided in response to identifying barriers and enablers to physiotherapy engagement in critical care research, and further themes identified from them, are summarised in Table E2.

Lack of protected time and funding were emphasised as barriers, in keeping with the high response levels (82.1% and 66.0% respectively) to those specific response options in the main question. Lack of support from senior management also featured strongly in comments, again a barrier echoed from the existing response options.

New themes identified in the free text comments could be divided into two categories:

- i) Profile of research within the physiotherapy profession including issues such as:
 - a. a lack of research ‘culture’ within physiotherapy,
 - b. a lack of integration of research within clinical roles,
 - c. a lack of defined job specification for those whose clinicians whose roles involve a research component e.g. the proportion of time assigned for research.
- ii) Profile of physiotherapists within the research community:
 - a. Lack of physiotherapy-specific research posts
 - b. Research posts being advertised to nurses specifically, rather than the wider MDT

With regard enablers to physiotherapy engagement in research, free text comments often centred on removal of barriers i.e. more protected time, greater funding rather than ‘new’ strategies per se. There was enthusiasm for the combined role of clinical academics, and suggestions that opportunities to be involved with, but not necessarily lead, research would be valuable.

Table E2. Analysis of free-text comments regarding barriers and enablers to physiotherapy engagement in critical care research

Qualitative comment	Theme
BARRIERS	
<i>"I am a band 5 who has never been on critical care before so I am spending all my time learning the area and would have no time for research"</i>	Need to prioritise acquisition of clinical skills for junior staff
<i>"The perception that this is difficult to achieve with patient caseload, rotational staff teaching with current resources"</i>	Lack of protected time*
<i>"Carry out audits and service development need direction with regards writing up for publication/conference presentation"</i>	Insufficient skill set*
<i>"supportive boss but all about time management with not enough staff"</i>	Lack of protected time* Lack of staffing
<i>"Most critical care research is via big studies that involve nurse participation not therapies. Since I qualified 20 years ago, I can't think of any research opportunities involving therapies in our Trust. It all seems to be Consultant and Nurse participation. There is probably good reasons for this ? due to the huge amount of variables or jobs available in research. On my Critical care unit, there is a specific team of 2 nurses who are employed to collect data and enrol into studies. They have the opportunity to write or be co-writers in studies"</i>	No/minimal opportunities for PT to be involved with research
<i>"Undertook my MSc a long time ago - graduated 2005 after many years struggling to undertake each component with no support and minimal funding. Since then, staffing pressures and changing roles have meant that no further research activities have been undertaken. I do think that the current climate is now much more positive towards research, but I suppose I now feel I have become out-of-date and lost confidence in myself in this respect. Funding is also a major issue."</i>	Lack of support from senior staff/management* Lack of protected time* Insufficient skill set* (need for refresher courses) Lack of funding* Lack of staffing
<i>"No specific research posts - impossible to be a clinician, manager and educator plus a researcher. Unfortunately research is not a priority when you are not employed to do research".</i>	Lack of protected time* Lack of research posts
<i>"Only funding streams in our trust are currently through the NIHR and rely on backfill which then limits ability to apply. Also then pushed to follow career pathway of NIHR which may not be for everybody. Limited other options to access funding to complete research as part of clinical role and above options take you away from clinical practice. Also limited funding / study leave support to embark on a masters".</i>	Lack of funding* Lack of diversity in funding stream Lack of support from senior staff/management* Lack of integration of research in role
<i>"Lack of time to complete research on top of clinical case load. "</i>	Lack of protected time*

<i>"Clinical priorities are paramount. Poor understanding of the benefits of physiotherapist involvement in research at a departmental managerial level. No push for publications/ posters etc. Research pathway not integrated into job roles (i.e. no dedicated time although research priorities in job description). Reluctance to support applications - even when funding is available because there is perceived difficulty in getting backfill. "</i>	<i>Lack of protected time*</i> <i>Lack of support from senior staff/management*</i> <i>Lack of recognition for PT role in research</i> <i>Lack of integration of research in role</i>
<i>"Although I have carried out research and am currently involved in a qualitative project I find it difficult to keep my skills updated and the opportunities for involvement in projects is not easy to access."</i>	<i>Unsure what opportunities are available and/or unsure who to approach to find out*</i> <i>Difficult to maintain skills</i>
<i>"No previous experience to research within clinical field therefore confidence and knowledge biggest personal barriers"</i>	<i>Lack of experience*</i> <i>Lack of confidence*</i>
<i>"This research needs to be set up and encouraged by senior therapists and clinical specialists and then filtered down. If this is not happening at your area of work then it's very difficult for rotational staff to be involved"</i>	<i>Lack of structure/culture for research in PT departments</i>
<i>"Above ticked boxes refer to own personal insufficient skill set/experience/knowledge/confidence, with support from seniors currently I am able to take part in research and develop on these. Due to the dynamic nature of critical care it can be difficult to maintain protected time to complete research/project related work. "</i>	<i>Lack of protected time*</i>
<i>"Within my organisation there is a lack of role model or leadership in research. None of our Clinical Specialists/ Leads (including those from outside of Critical Care) have ever been involved in research and many do not even have a Masters. There is a lack of research culture within my Therapies Department and therefore no one to set a benchmark or to guide others. Also, research is time consuming and funding just isn't there. "</i>	<i>Lack of structure/culture for research in PT departments</i> <i>Lack of protected time*</i> <i>Lack of funding*</i>
<i>"Lack of protected time is the main problem. Even if research responsibilities are part of a JD, there is no system to allow protected time (e.g. research PAs as per Drs job plans). In addition the funding does not necessarily cover clinical grades >8a, which tend to have research written in to a JD. Research opportunities tend to be as part of academic qualifications (MSc/MRes/MPhil/PhD) or discrete projects embedded within academic career pathways (Fellowships etc). It feels as though there is little real opportunity to combine clinical and research activity within a clinical career pathway, whereby research physiotherapist posts or research PAs are embedded as part of clinical services (as is the case for research nurses or Drs). It seems to me that physiotherapists are faced with one of two choices a clinical career or and academic career. Funding and career pathways for physiotherapists need to be reviewed to allow physiotherapists to continue to practice clinically with research embedded as part of a clinical service. Ultimately, we are at risk of siphoning off skilled clinicians in to academia or limiting the opportunity for those with newly developed (through the existing NIHR opportunities) or with established research skills to apply those skills within clinical services. Either way the concept of research embedded in frontline services and led by frontline staff is hard to realise for Physiotherapists"</i>	<i>Lack of protected time*</i> <i>Lack of funding*</i> <i>Lack of integration of research in role</i>

<i>"lack of time and motivation due to poor staffing levels and current workload"</i>	Lack of protected time* Short staffing
<i>"Despite an MSc in Advanced Practice, and performing extended roles, I have never been able to negotiate any extra banding. I am reluctant to keep extending my skills when it is clear there will be no extra remuneration or opportunities for higher grade. I shouldn't be performing band 8 roles for band 7 salary"</i>	Lack of financial incentives/reward for extended skills
<i>"I will be moving back to my post in critical care and would be very keen to carry out research into prehab for our OG pts but am having difficulty knowing where to start who to approach. Have a wee team who are keen to assist but don't know how to take it forward"</i>	Unsure what opportunities are available and/or unsure who to approach to find out* Lack of experience*
<i>"There is a definite lack of support for research or the importance of research even though this could take the form of audits and service evaluation. No time however is available for these things so this would have to be undertaken in our own time. I am also rotational so 9 months does not allow time to develop projects and ideas so for me lack of static posts within critical care/career progression is a particular barrier. There is research happening within the critical care unit but this is medical focused and there are no physios involved only research nurses."</i>	Lack of support from senior staff /management* Clinical rotations too short to allow involvement* Lack of recognition for PT role in research Lack of structure/culture for research in PT departments
<i>"In our current situation the clinical caseload takes priority over all 'non-essential activities' and sadly research is viewed as non-essential"</i>	Lack of protected time*
ENABLERS	
<i>"I think one of the issues is the complexity of carrying out research in this area. I think clinical staff should be encouraged to do more service improvement initiatives and publish their findings. Training on this would be really useful and potentially more applicable in many roles."</i>	Increased access to research training*
<i>"More of a profile, highlighting therapists' knowledge and skills in research. More protected time or secondment time. Time to write review and research interventions. Post grad courses on how to get your foot in the door how to be recognised, how to link and network and understand the statistical jargon."</i>	Need to increase PT research profile Need for protected time Increased access to research training
<i>"Nearly all of the above for me. Getting some into practice, without established research units and staffing being the way it is will be a significant challenge (e.g. rotational objectives). Would be good though!"</i>	BARRIERS: Poor staffing, clinical rotations too short to allow involvement*, lack of structure/culture for research in PT departments
<i>"Time to participate"</i>	Need for protected time

<i>"Support from physio managers re staffing and time. We are already understaffed for 5 days but providing a 6-day service can't fit any more in the week."</i>	Need for protected time Need for improved staffing
<i>"The only Physios I know who do research in critical care are 'research physios', I think that by developing combined clinical-academic roles it would help more staff to appreciate that being involved in research is achievable within their current role."</i>	Creation of combined clinical-academic positions*
<i>"Multicentre studies with lead from external researcher from within a culture and structure (with support) of a research centre"</i>	Opportunities to be involved with, but not lead, research
<i>"Any more support would be helpful. A large limitation is the caseload requirement. We have guidelines on WTE/bed and guidelines on access to Physiotherapy from ICS and NICE etc but there is nothing locally/nationally about protecting posts or having specific research descriptions/no. of hours within posts - this would help."</i>	Guidance on research infrastructure
<i>"Being aware of tangible outcomes/improvements from the research, being able to apply and improve practice as a result."</i>	Improved dissemination and implementation of research findings
<i>"I do not wish my comments to appear negative but as a small District General with less than 100 beds we are using our HDU as a step up facility rather than the level 3 it used to be. Our staffing levels are very low and although I would have liked to be involved with research, it would always have been at the sacrifice of patients' treatments, i.e. no ring-fenced time."</i>	Barrier: lack of protected time*
<i>"I feel that mostly critical care colleagues value physiotherapists and their contribution to research within units, however, I don't feel they have an appreciation of the requirement of PT departments / directorates to develop and deliver their own research strategies and agendas, both professionally and to meet organisational objectives. This may then create tension in terms of priority and support for physiotherapy led research within the critical care setting, with competing priorities."</i>	New barrier theme: lack of structure/culture for research in PT departments
<i>"Networks are key and the opportunity to link in/join networks should be simple and widely advertised."</i>	National PT network to link research-active critical care physiotherapists*
<i>"I have great support from ICU consultants. My concern is if I step out into a research post I am not guaranteed that I will get my old post back when the research/ secondment is finished"</i>	Greater support from Critical Care colleagues e.g. intensivists* New barrier theme: lack of job stability in research
<i>"Would love a clinical-academic position!"</i>	Creation of combined clinical-academic positions*
<i>"I think that greater information about local physio studies would then increase confidence to be able to take this experience back to our own hospitals. Within large physiotherapy studies whether it would be possible to spend a day with the research teams to get an idea of what goes on etc?"</i>	Greater information about local critical care physiotherapy studies* Opportunities for visits to research teams
<i>"Our intensivists are very supportive of research and audit but from a therapies point of view our clinical caseload could not be impacted upon meaning the majority of training/research would have to be in own time"</i>	Greater support from Critical Care colleagues e.g. intensivists* Barrier: lack of protected time*

*existing response option in original question. Abbreviations: PT = physiotherapy

E3. Free-text comments regarding other research opportunities and any other aspect of the survey

Enthusiasm about involvement across research activities was expressed (Table E3), with several participants expressing that they wanted to be involved with 'anything'. There were also a few suggestions that small steps towards research involvement might be useful – such as how to support others in research and support to be a co-investigator rather than leading on a project. Analysis of overall comments from respondents regarding any aspect of the survey are presented in Table E4.

For peer review only

Table E3. Analysis of free-text comments regarding other research activities to engage with

Qualitative comment	Theme
<i>"already happily/actively involved"</i>	Already involved
<i>"I'm already involved with all of the above"</i>	Already involved
<i>"I would like to get involved with any research opportunities"</i>	Anything
<i>"Not applicable as I am currently in a full time research position"</i>	Already involved
<i>"I am already involved in these activities but also interested in collaborations"</i>	Already involved Collaborations
<i>"Time to think about research"</i>	Protected time*
<i>"I would be happy to be involved in the intervention part of a research project"</i>	Delivering interventions
<i>"Already involved"</i>	Already involved
<i>"Due to barriers don't think I have the capacity to be involved"</i>	None – too many barriers
<i>"Any Physiotherapy relevant research!!! "</i>	Anything
<i>"already research active"</i>	Already involved
<i>" Any opportunity welcomed"</i>	Anything
<i>"I am heading towards the end of my career and the constant staff shortage and increase in Mandatory training for staff means that any involvement in research would be impossible"</i>	None – too many barriers
<i>"Supporting others interested in research"</i>	Supportive role for others (mentorship)*
<i>"I might be interested in research if I had a mentor or guidance. Even to be a co-author or co-researcher and not necessarily lead a research project myself. If I had more confidence in my abilities and more support perhaps it would be something I could do in future. I have some experience in research having completed a Masters project but I would hesitate to start a big research project on my own"</i>	Support to be a co-investigator (mentorship)*
<i>"I suppose a step back: idea development - with like-minded colleagues, would like to do something PT specific, say rehab effects on VV ECMO, we need multi sites"</i>	National physiotherapy network to link research-active physiotherapists*
<i>"I have the skills to do those research tasks in which I already participate. "</i>	Already involved
<i>"Any opportunities would be welcomed. Also chance to be part of projects going on elsewhere in the area if possible. "</i>	Anything Greater information about local critical care studies*

*existing response option in original question.

Table E4. Analysis of free-text comments regarding any other aspect of the survey

Qualitative comment	Theme
<i>"ICU Physios generally leave ICU as they get older as it's a very physically demanding role - you don't see many ICU fully clinical physios beyond the age of 40. However very few go into research roles, they tend to leave to community jobs or into management. It would be great to influence those in senior ICU roles to be encouraged to take a more active involvement in research as they are clinicians with a wealth of experience. Also a lot of ICU clinical research roles are advertised as nursing roles"</i>	Opportunities for less physically able/older PTs
<i>"We need more of a profile, we are seen as sputum managers and yet our knowledge in anatomy and physiology, rehabilitation, critical illness polymyoneuropathy, neurology, orthopaedics, medical, surgical is often overlooked. In our Trust all our on-call staff rate the critical care unit as a particularly unfriendly place to work. The cultures and perceptions of our role as therapies needs a revamp to be able to include us more in research and development. I would guess we are all keen, just disillusioned by the lack of knowledge and respect critical care staff have regarding therapies and their skills."</i>	Need to increase PT research profile lack of structure/culture for research in physiotherapy departments*
<i>"The PT career pathway needs to be developed like the doctors - they have research/clinical pathways which give the research fellows time to devote their efforts into research and delivery of research finding. PT's on the shop floor can't do that - we are stretched enough and research takes a long time. I have tried and failed"</i>	Need to increase PT research profile* Lack of structure/culture for research in physiotherapy departments*
<i>"Protected time is one of the issues, and guidance or awareness of how to structure research. Identification of support systems would be extremely beneficial."</i>	Lack of protected time* National physiotherapy network to link research-active critical care physiotherapists* Insufficient skill set*
<i>"My research is currently related to simulation on on-call training which does involve critical care patients - it is not necessarily specific purely to critical care patients. As research is written into my job description I am in a position to allocate time to it. I was empowered to protect time - I think all 8a JDs should specifically have an element of research documented in order to empower people to take time in their allocated work time."</i>	Benefit of clear research allocation in job role* Need for role models*
<i>"As the only static PT on critical care in a part time capacity it is difficult to initiate & complete research. My aim is to complete an MSc module as a starting point. I currently undertake Quality Improvement projects / audit however have not undertaken an independent research study & would enjoy working with others at local hospitals to increase confidence to be able to achieve this."</i>	Lack of protected time* Increased access to research training* Greater information about local critical care studies* National physiotherapy network to link of research-active critical care physiotherapists*

<i>"Support from critical care colleagues and Intensivists is strong as there is already an established critical care research profile and often they are keen for physiotherapists to be involved. However, time constraints and clinical priorities are often the main barriers. It would also be very useful to have a database of research active critical care PTs to encourage peer support and collaboration."</i>	National physiotherapy network to link of research-active critical care physiotherapists* Lack of protected time*
<i>"The research culture within critical care physiotherapy teams varies greatly between trusts and clinical areas. It is extremely difficult within my trust to get any protected time to undertake research."</i>	Lack of protected time*
<i>"Time spent towards research is currently limited towards service development projects which lead onto potential abstract submission. In the current climate there does not seem to be enough time to be able to dedicate to going the extra mile with a full research project and currently service development projects are a stretch which is a shame. We aim to have service development/research as a part of the teams objectives to keep things moving forwards but these are tending to take longer to achieve due to staffing shortages and clinical pressures"</i>	Lack of protected time* Lack of staffing
<i>"At this moment in time, I am not interested in participating in research due to other large projects at work and young family at home. I may be in the future. I think having research skills are useful for staff (e.g. critical appraisal, proposal writing, writing up projects) in order to conduct audits and service improvement. I see that staff who have done masters level study are more inclined to lead and participate in service improvement at a physio department / team and at a trust level."</i>	Lifestyle aspects and broader value of research-trained staff in leadership roles etc
<i>"As with everything there is not enough hours in the day to get clinical work done let alone the management service development aspect of job role so being able to even think about doing an research is so far down the priority level it just doesn't get any thought. This in conjunction with not knowing what can be done or how to go about it is a non-starter. "</i>	Lack of protected time* Lack of prioritisation of research Lack of skills*
<i>"I feel my main barriers to research have been: Lack of expertise Lack of dedicated time"</i>	Lack of skills* Lack of protected time*
<i>"The biggest barrier is that-Lack of clear career/ research/professional pathway for our profession eg Drs have a clear professional/ training career pathway which is well supported and resourced!! "</i>	Lack of structure/culture for research in physiotherapy departments*
<i>"Our Unit involved in PRISM, BREATHE, LEOPARDS - anaesthetic lead with dedicated Research nurse. No time within my role to undertake Physio research currently. "</i>	Lack of protected time*
<i>"We need to raise the profile of physiotherapy through research. I have lots of ideas but have been unable to carry them through due to some of the reasons listed above, and now my consultants are moving on with the ideas"</i>	Need to increase PT research profile*
<i>"Would like to be involved in research but haven't considered it an option previously. Would be good to see secondment project opportunities or protected research time with clinical hours backfilled"</i>	Lack of structure/culture for research in physiotherapy departments* Need for protected time* with backfill Creation of secondment opportunities into research teams*

"I think this is an excellent idea. There are untapped resources in hospitals outside of the major cities which could add to the weight of evidence of our worth in critical care. We just need the confidence and time to go out and capture it!"

Lack of confidence*

*existing response option in original question.

For peer review only

CHERRIES Checklist

Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

Bronwen Connolly^{1, 2, 3, 4}, Laura Allum¹, Michelle Shaw⁵, Natalie Pattison⁶, Paul Dark⁷

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Item category	Checklist item	Page number
Design	Describe survey design	6-7
IRB (Institutional Review Board) approval and informed consent process	IRB approval	6
	Informed consent	6
	Data protection	6
Development and pre-testing	Development and testing	6-7
Recruitment process and description of the sample having access to the questionnaire	Open survey versus closed survey	7
	Contact mode	7
	Advertising the survey	7-8
Survey administration	Web/E-mail	7-8
	Context	n/a
	Mandatory/voluntary	6
	Incentives	n/a
	Time/Date	8
	Randomisation of items of questionnaires	n/a
	Adaptive questioning	7
	Number of items	7
	Number of screens (pages)	n/a
	Completeness check	7
	Review step	n/a
Response rates	Unique site visitor	n/a
	View rate (Ratio of unique	n/a

	survey visitors/unique site visitors)	
	Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	8
	Completion rate (Ratio of users who finished the survey/users who agreed to participate)	8
Preventing multiple entries from the same individual	Cookies used	n/a
	IP check	n/a
	Log file analysis	n/a
	Registration	n/a
Analysis	Handling of incomplete questionnaires	8
	Questionnaires submitted with an atypical timestamp	n/a
	Statistical correction	n/a

BMJ Open

Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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Manuscripts

Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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The authors declare they have no competing interests

AUTHOR CONTRIBUTIONS

BC conceived the study, developed and conducted the survey, completed data analysis and interpretation and drafted, revised and agreed the final manuscript version for submission. LA contributed to data entry, analysis and interpretation. MS contributed to survey development. NP contributed to study design, survey development and data interpretation. PD contributed to survey development and data interpretation. All authors contributed to manuscript revision and approved the final version for submission. BC acts as the guarantor for the intellectual integrity of the data.

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Data referenced in citation 27 derive from the Case Mix Programme Database. The Case Mix Programme is the national, comparative audit of patient outcomes from adult critical care coordinated by the Intensive Care National Audit & Research Centre (ICNARC). For more information on the representativeness and quality of these data, please contact ICNARC (icnarc@icnarc.org).

DATA SHARING

All data pertaining to this study are reported in this manuscript.

ABSTRACT

Objective

To characterise the research profile of UK critical care physiotherapists including experience, training needs, barriers and enablers to engagement in critical care research. ‘Research’ was defined broadly to encompass activities related to quantitative and qualitative studies, service evaluations, clinical audit and quality improvements.

Design

Closed-question online survey, with optional free-text responses.

Setting

UK critical care community

Participants

UK critical care physiotherapists, regardless of clinical grade or existing research experience

Results

Two-hundred and sixty-eight eligible survey responses were received during the twelve-week study period (21 incomplete, 7.8%). Respondents were based in university-affiliated (n=133, 49.6%) and district general (n=111, 41.4%) hospitals, and generally of senior clinical grade. Nearly two-thirds had postgraduate qualifications at Master’s level or above (n=163, 60.8%). Seven had a doctoral level qualification. Respondents reported a range of research experience, predominantly data acquisition (n=144, 53.7%) and protocol development (n=119, 44.4%). Perceived research training needs were prevalent, including topics of research methods, critical literature appraisal, protocol development and statistical analysis (each reported by ≥50% respondents). Multiple formats for delivery of future research training were identified. Major barriers to research engagement included lack of protected time (n=220, 82.1%), funding (n=177, 66.0%), and perceived experience (n=151, 56.3%). Barriers were conceptually categorised into capability, opportunity and motivation themes. Key enabling strategies centred on greater information provision about clinical research opportunities, access to research training, secondment roles, and professional networks.

Conclusions

UK critical care physiotherapists are skilled, experienced and motivated to participate in research, including pursuing defined academic research pathways. Nonetheless wide-ranging training needs and notable barriers preclude further involvement. Strategies to harness the unique skills of this profession to enhance the quality, quantity and scope of critical care research, benefiting from a multi-professional national clinical research network, are required.

Word count 286

ARTICLE SUMMARY

Strengths and limitations of this study

- Critical care is a complex specialty by nature requiring a multi-professional and research-enabled workforce to maximise research planning and delivery for optimum patient benefit
- This is the first survey to detail the research profile of UK critical care physiotherapists to assist in building research capacity within the critical care workforce
- Barriers and enablers to engagement of critical care physiotherapists in research have been identified to support development of strategies to enhance future involvement
- Strengths of study methods include sustained use of multiple and diverse routes of survey dissemination, ease and speed of online completion, and potential for replicability
- Potential limitations include a profession-specific target population, lack of known denominator to determine accurate response level, and predominance of clinician respondents over those from academic institutions

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6 **INTRODUCTION**

7 Critical Care is an identified specialty therapy arena within the UK’s National Institute for Health
8 Research (NIHR) (<https://www.nihr.ac.uk/nihr-in-your-area/critical-care/>). National and local Clinical
9 Research Network (CRN) infrastructure is synchronised to provide oversight and logistical support
10 enabling high quality conduct and delivery of the NIHR research portfolio
11 (<http://www.nihr.ac.uk/research-and-impact/nihr-clinical-research-network-portfolio/>). Currently
12 96% of NHS England’s intensive care units (ICU) contribute to clinical research studies, one of the
13 most engaged critical care research networks internationally ¹. The NIHR Critical Care National
14 Specialty Group (CC NSG) comprises local CRN representatives who coordinate and review the
15 national critical care clinical research portfolio. Since 2014 the CC NSG, currently led by physicians,
16 has engaged physiotherapy representation within it. This is alongside other allied health professions
17 (AHP), including nursing and pharmacy, recognising that physiotherapists are key members of the
18 multi-professional team contributing to achievement of its research agenda. Fostering multi-
19 professional research workforce development and sustainability is an important mission for the CC
20 NSG.

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Developing a strategic approach to research-capacity building in allied health professions, such as
physiotherapy, may be complex but is important for enhancing healthcare research across basic
science, translational, service delivery and implementation ². Impact and value are seen at
individual, team and clinical service levels when research roles for AHP are invested in ³.
Furthermore, increasing emphasis on evidence-based practice has required greater potential and
expectation for AHP assimilation of research to inform the clinical decision-making process ^{4 5}.
However contributing to multi-professional research effort at scale in NHS critical care could require
involvement of clinicians trained to appropriate regulatory Good Clinical Practice (GCP) standards ⁶,
but who lack other formal research training or experience ⁷. Identifying research-trained
physiotherapists and establishing levels of skill, competency and expertise would contribute
significantly to supporting the planning and delivery of the best research for patient benefit. In
addition this would facilitate and build collaborations, and raise recognition of the profession.

Intensive care medicine, as a profession, encourages exposure to clinical research at varying stages
of professional training for all trainee clinicians and a smaller number choose a more structured
clinical academic research training pathway ⁸. In the absence of a formal postgraduate clinical

training programme for critical care physiotherapy, clinicians have empirically integrated research commitments within existing clinical roles to acquire skills and experience, supplemented by postgraduate qualifications albeit access to these may be subject to local variability in financial and logistical support. The advent of the NIHR over the last decade has provided dedicated allied health profession pathways for pursuing a defined clinical academic career (<https://www.nihr.ac.uk/funding-and-support/funding-for-training-and-career-development/training-programmes/>). However, capturing these data at a profession-wide level is challenging with a paucity of work in this field. This survey therefore aimed to characterise the research profile of UK critical care physiotherapists, perceived training needs, and barriers to engagement in critical care research.

METHODS

Study design and ethical approval

This study involved the development of a national online survey of UK critical care physiotherapists conducted on behalf of the UK NIHR CC NSG. The survey did not require ethical approval (UK Health Research Authority⁹), and no local institutional Research & Development Department approval was necessary (Guy's and St. Thomas' NHS Foundation Trust, London, UK). Participation was voluntary and consent confirmed by accessing and completing the online survey. Inclusion of participant name was optional, known only to two of the researchers (BC, LA) and used only to facilitate follow-up of incomplete surveys. This study was conducted and reported in keeping with suggested good practice for surveys¹⁰ and adhering to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES)¹¹.

Sampling and survey population

Survey respondents included any UK critical care physiotherapist, regardless of existing research experience or clinical grade and employed in adult or paediatric subspecialties. At present there is no formal database of such clinicians, and we adopted a pragmatic approach to enable responses from as many clinicians as possible within a defined timeframe who aligned themselves as a physiotherapist specialising in critical care. Responses from non-physiotherapists were excluded.

Survey development

An online survey was designed by the authors (Online Supplement, Section E1). The survey was modelled and expanded upon a recently published survey of intensive care medicine trainees with a similar aim⁷, with additional content considered relevant by the authors for addressing the current

study aims. Item generation and reduction were completed internally by the review authors during survey design which also allowed for confirmation of both content and construct validity¹². The draft survey was developed offline; clinical sensibility and face validity testing were conducted through piloting the survey with 6 critical care physiotherapists of varying clinical seniority grade and existing research experience to refine the quality and interpretation of questions¹³. Feedback was requested on i) comprehension and interpretation of questions, ii) flow, salience, acceptability and ease of completion, iii) identification of missing items requiring questioning, or response options to existing questions, iv) time required for survey completion¹². Comments from this process resulted in clarification of seven questions and additional responses added to six questions. On average the survey was reported to take no more than 10mins to complete. Once transferred to the online electronic format, the final survey was tested by one further independent physiotherapist.

The final survey consisted of four sections; i) Background (demographics), ii) Research Experience, iii) Research Training Options, iv) Barriers to Research Engagement. ‘Research’ encompassed activities related to quantitative studies, qualitative studies, service evaluations, clinical audit and quality improvements. If completed in full, the survey totalled 25 questions. The majority of questions were closed-question nominal format involving response selection from multiple non-ranked options. . Where applicable, questions always contained an ‘Other’ option to enable free-text comments from respondents. Question layout followed recommended approaches e.g. categorised into sub-sections, numbered and with response options appearing on separate lines, with multiple-item screens and short-entry boxes¹². Furthermore electronic functionality to enhance completion was optimised e.g. filtering of questions according to ‘Yes/No’ response, and limiting progression until specific answers provided.

Survey Distribution

Survey distribution occurred for an *a priori* defined 12week period, with an additional 4week follow-up period to contact respondents with missing data. A personalised opening cover letter was included and the lead author’s contact details were circulated on the survey link to respond to any individual queries regarding survey completion. An electronic link enabled respondents to access the online survey and a variety of strategies to access potential respondents were employed including: the NIHR CC NSG and CRN distribution lists (members of the NIHR CC NSG, and representatives of all NHS Trusts within each of the local CRN areas respectively; individuals on these lists were requested to disseminate the survey to their local critical care physiotherapy colleagues); advertising on the NIHR CC NSG website; the UK Critical Care Research Group distribution list (any

clinician who has attended the national meeting of this Group in the last three years); clinical professional specialist interest group websites and membership newsletters; local networks of clinical colleagues; social media links; a national UK critical care course for physiotherapists; and snowballing. Regular re-circulation of the survey link was conducted via these routes during the 12-week period. At the end, incomplete survey responses were identified. Where respondents left contact details attempts were made to request missing data. Response data were recorded electronically in bespoke survey software (Survey Monkey®, San Mateo, CA, US, <https://www.surveymonkey.net/>) and then exported into Microsoft Excel format (Microsoft Office 2013, Microsoft Corp, Redmond, WA, US) for analysis.

Patient and Public Involvement

No patients or public were involved in any aspect of this study as it focused on development of a clinician-targeted survey to determine research engagement.

Data analysis

Quantitative data were analysed descriptively using counts and percentages. Ordinal data were reported as medians (inter-quartile range, IQR). Qualitative comments were analysed for recurrent themes using free text analysis¹⁴ by one researcher (LA) and reviewed by the primary author (BC), removing any potentially identifiable text in advance. One researcher (BC) additionally mapped results to a behaviour change framework involving three essential interacting conditions (capability, opportunity, motivation) that modify and influence the behaviour; the COM-B system¹⁵. In this study the 'behaviour' was critical care physiotherapy research engagement, and findings were best placed under the sub-headings of each condition (Capability - physical and psychological; Opportunity – Social and Physical; Motivation – Automatic and Reflective). In the absence of a known denominator for the total number of UK critical care physiotherapists, it was not possible to set a target *a priori* response rate. Instead the overall number of responses acquired during the 12-week survey period were collated. Analyses were performed using GraphPad Prism version 7.0d (GraphPad Software, La Jolla, CA, US, www.graphpad.com).

RESULTS

Respondents

Two-hundred and seventy-one responses were received during the survey period (30th August to 22nd November 2016, with additional follow-up as aforementioned), of which 3 were excluded (n=2 duplicate, n=1 non physiotherapist), leaving 268 in the final analysed sample. Twenty-one responses

remained incomplete after attempted contact (7.8% (n=16 no contact details)). . Demographic data for the cohort are provided in Table 1. Respondents were almost equally based within University-affiliated (n=133, 49.6%) or District General (n=111, 41.4%) hospitals, although the vast majority were located in England (n=234, 87.3%). Median (IQR) clinical seniority of respondents was Band 7 (6-7) indicating a senior, specialist grade (higher bandings indicate greater seniority). Nearly two-thirds of respondents had a postgraduate qualification at Master’s level or above (including individual modules) (n=163, 60.8%), with funding provided locally in half of cases (n=132, 49.3%). Seven respondents had a doctoral level qualification.

Research experience

Two respondents did not complete this section (0.7%). Of the remaining 266 respondents, 227 (84.7%) indicated existing research experience. Frequency of involvement in types of research activity varied (median (IQR) 2 (1-3) different activities). Most commonly respondents indicated experience of participation in local/regional audits or service evaluations (n=204), with 116 respondents reporting attending a research-related course. One-hundred and twenty-nine respondents reported involvement in either multi- or single-site studies, and 76 had research publication experience (first, co-, or senior author). Ninety-one respondents had submitted a conference abstract, and 31 had completed a dedicated postgraduate research qualification.

Sixty-five respondents (24.2%) indicated current involvement in research as chief (n=13), principal (n=17) or co- (n=21) investigator or in a research physiotherapist/assistant role (n=21). Other roles included strategic positions e.g. as director of an institutional research centre. Respondents were predominantly involved in quantitative study types (randomised and non-randomised controlled trials, n=22; observational studies, n=23), but also reported methodological and review-based research (feasibility studies, n=19, systematic review, n=2, methodological study, n=1) and qualitative (n=20) research design. Survey (n=4), epidemiological (n=4) and case study, proof-of-concept and mixed methods (n=1each) research studies were also reported. The majority of studies that respondents were involved in were either publicly or self-funded (n=53, 81.5%).

Two-hundred and fifty-seven respondents (95.9%) described research activities they had previous or current experience of (Table 2). More than fifty percent had been involved with data acquisition or completion of outcome measure assessment in studies, followed by protocol development. The vast majority of respondents had no allocated time for research in their current role (n=210, 78.4%). On average, respondents with some allocated research time ranged from between 3days/week to full

time (n=4s, 1.5%), between 1 and up to 3 days/week (n=15, 5.6%), less than one day/week (n=18, 6.7%) and less than one day/month (n=9, 3.3%).

Seventy-one respondents (26.5%) had completed Good Clinical Practice (GCP) training. Of the remaining 186 respondents, 149 (55.6%) reported a lack of familiarity with what GCP involved, 27 (10.1%) reported they would like to complete GCP training but could not access it locally, 7 (2.6%) were scheduled to attend and 3 (1.1%) did not feel GCP training was necessary.

Research training needs

Respondents were asked to identify research training topics they would benefit from (Table 3). Two-hundred and fifty-one respondents (93.7%) completed this question. Most frequently reported topics included research methods, critical appraisal of literature, protocol development and statistical analysis, all identified by at least fifty percent of respondents. Least reported training topics included epidemiology, and recruitment and consent. Respondents (n=250, 93.3%) reported a variety of methods of delivery of research training topics including courses/workshops run either on a weekday (full day, n=135 (50.4%), half-day, n=62 (23.1%)), weekend (full day, n=76 (28.4%), half-day, n=37 (13.8%)) or evening (n=33, 12.3%) or via online (n=145, 54.1%). Analysis of free-text comments from respondents in relation to this question is provided in the Online Supplement (Table E1). Twenty-eight respondents (10.4%) reported they would not be interested in any research training.

Barriers and enablers to research engagement

Of respondents not currently involved in research (n=195, 72.8%), the vast majority (n=167, 85.6%) indicated they would like the opportunity. Research activities that respondents expressed interest in included data collection/recording (n=142, 53.0%); leadership and conduct of own projects (n=129, 48.1%); dissemination activities (n=114, 42.5%); data analysis and interpretation (n=109, 40.7%); writing abstracts for conference submission (n=96, 35.8%); manuscript writing for publication (n=87, 32.5%); recruitment and consenting (n=83, 31.0%); eligibility screening (n=72 26.9%).

All respondents, regardless of existing involvement in research, were asked to indicate perceived barriers to physiotherapy involvement in critical care research, and initiatives to improve this (termed 'enablers') (Table 4). Most frequently identified barriers were lack of protected time (n=220, 82.1%), lack of funding (n=177, 66.0%) and lack of experience (n=151, 56.3%). Key enablers centred on information provision including knowledge of local critical care physiotherapy studies

and around opportunities for involvement in studies. Analysis of free-text comments from respondents in relation to this question is reported in the Online Supplement (Table E2). New themes of barriers that were identified centred on the profile of research within the physiotherapy profession, and the profile of physiotherapists within the wider research community.

Qualitative data

Qualitative free-text comments from respondents regarding any aspect of the survey were analysed are summarised (Online Supplement, Tables E3 and E4). In the majority of cases comments reflected existing response options to previous survey questions e.g. mentorship to assist those commencing involvement in research, lack of protected time, the potential benefits of mentorship and peer support, or greater information provision about local critical care research studies. However these comments were considered valuable for providing an additional personal narrative to contextualise the quantitative data.

DISCUSSION

This study reports the first findings of their kind detailing characteristics of experience, training and engagement in research of the UK critical care physiotherapy workforce. The results demonstrate a skilled, experienced and motivated workforce constrained by logistical, knowledge-related and professional cultural factors. Key enablers to research engagement primarily centre on improvements in information provision around critical care physiotherapy and non-physiotherapy studies, broadening opportunities for formal research involvement, increased access to training and greater numbers of secondment opportunities into established research groups. Findings from this survey underscore the importance and value of building research capacity in the critical care physiotherapy profession ^{2 16}, and enable the prioritisation of actions to support developing and sustaining a research-enabled critical care workforce involving physiotherapy.

Significance of the findings

Research activity in UK ICUs is evidently high, as reflected by the percentage of units supporting the national research portfolio. However this does not appear commensurate with equally high levels of research involvement by physiotherapists. These survey findings suggest a potential disconnect, highlighted by the depth of detail we have captured at individual clinician level in particular around barriers to involvement, in contrast to the relatively insensitive metrics used to determine research delivery at a unit-level. Clinicians indicated a wide range of research experience that, if harnessed

and nurtured appropriately, could support future studies led by, and in collaboration with, critical care physiotherapists. In turn this could assist in maintaining and diversifying the national portfolio beyond existing levels. Critical care is by nature a complex specialty provided by a multi-professional team; consequently the best research for patient benefit is likely to arise secondary to engagement of all members of that team. These findings also mirror the international evidence base exploring AHP engagement in research^{4 17-20} supporting their generalisability and confirming consistent themes across disciplines and different healthcare jurisdictions.

To understand factors contributing to current levels of physiotherapy engagement in critical care research, results were broadly mapped to a common behavioural change model, the COM-B framework (Figure 1)¹⁵. Addressing any component of COM-B can facilitate behaviour modification; in this instance, the 'behaviour' being involvement in research. For example, major opportunity-related barriers reported by clinicians were lack of protected time and funding with clinicians attempting to incorporate research opportunity within day-to-day clinical roles. This scenario of research capacity balanced against resource restriction is not uncommon within physiotherapy^{21 22}, and may be difficult to immediately rectify with ever-increasing demands on clinical service delivery and competing priorities. That said, one enabler identified by respondents focused on awareness of available funding sources and this could be facilitated by identifying colleagues with knowledge and experience around identifying funding options for guidance. Insufficient knowledge, skills and confidence (capability) were other important barriers. Increased access to research training was a key enabler that could target this aspect. Importantly though, findings from this survey highlighted the need to consider flexible, multimodal and innovative forms of training in terms of content, design, format and delivery. One third of respondents reported that identifying key contacts with their local organisation would facilitate involvement in research. Whilst this has obvious practical benefits, it further speaks to the broader concept of requiring role models, mentors and leadership (motivation barrier) to set a template and provide guidance.

Quantitative and qualitative findings from this survey suggested a distinction between clinicians who had transitioned into a defined academic path e.g. research-specific Master's level qualifications and/or subsequent doctoral training, and those who had skill and experience (often considerable) and keenness for research involvement but who preferred to remain primarily clinical-facing; the concept of clinical academics and academic clinicians. The extent to which this concept truly exists requires further exploration amongst critical care physiotherapists, but could highlight differing approaches needed to integrate these different roles into the research community. Presence of a

positive research culture (both within physiotherapy departments and ICUs), perceived value of research by own and other professions, and the overall research profile of the physiotherapy profession were all factors identified by respondents that influenced their opportunity for involvement in research; in particular recognition from senior management and support from critical care colleagues were reported as beneficial factors. These findings echo similar themes identified from a previous survey of physiotherapy managers' of their departmental staff ²¹, and a separate observational study of physiotherapist researchers having completed PhDs ²³. In this latter study, key suggestions for improving research academic career paths included roles that allowed for clinical-research and academic-clinical combinations, securing adequate funding for physiotherapy research positions, and enhancing collaboration between academic and clinical researchers ²³. Certainly fostering partnerships between Universities and NHS institutions in the UK, in particular via Academic Health Sciences Centres, for honorary academic appointments could be valuable for accessing academic support and mentorship for clinicians. Furthermore improving patient healthcare through embedding research into routine clinical care is key for the NIHR, in line with NHS Constitution for England principles ²⁴ – this ethos provides support to those aforementioned clinicians wanting greater research exposure whilst remaining in direct clinical positions.

Moving forwards, these survey findings help to identify strategies to support greater involvement of critical care physiotherapists in research; indeed the impact of these findings could be more wide-reaching in principle relating to other allied health professions. Improving information provision around existing studies and secondment opportunities for involvement could be achieved through local and national research-based infrastructure; encouraging links between existing professional organisations to combine resources and promote funding and training opportunities; considering alternative models of working to incorporate research time into clinical job descriptions may be required, and engaging managers proactively to recognise the value of research-trained physiotherapists embedded in clinical services; and profiling positive examples of success to increase awareness amongst the multi-professional critical care team about the benefit of physiotherapy involvement in studies. In addition, developing peer-support networks akin to that which has been established by intensive care medicine trainees (<http://www.rafrainees.com/>), may be valuable for sharing experiential learning, offering access to mentors, and collaborative working, and the newly formed UK AHP/Nursing Network for Critical Care Research is an example of this. Finally, collaborating with other critical care professions to deliver generic research methods training would not only ensure efficient utilisation of resources and personnel, but likely broaden the depth and breadth of the overall learning experience and foster inter-professional links. Building research skills

and training into physiotherapy-specific competencies would mirror the approach taken in other medical specialities. Key to supporting these initiatives is the recent publication of the NIHR CRN Allied Health Professionals Strategy that sets out five strategic goals to realise the potential of AHP contributing to the conduct and delivery of NIHR research across the specialties (available at <https://www.nihr.ac.uk/our-faculty/clinical-research-staff/allied-health-professionals.htm>), and significantly highlights this area.

Critique of the method

These novel data from both quantitative and qualitative analysis highlight the research profile of UK critical care physiotherapists. Whilst the target population of respondents was profession-specific, which could limit generalisability, this study echoes the process and outcomes of a recent survey of UK intensive care medicine trainees which sought to understand how to improve trainee access to critical care research opportunities⁷. Furthermore, the current survey was in itself non-profession focused i.e. no questions were designed or phrased specifically related to physiotherapy per se. It could therefore easily be replicated across other allied health and nursing roles with little, if any, modification to generate larger volumes of similar characteristic data.

This study benefits from rigorous methods during the development, testing and delivery stages of the survey to optimise data acquisition. The focus of the survey was limited to acquiring descriptive information to provide a baseline phenotype of the current state of critical care physiotherapy engagement in research. Nonetheless further psychometric testing of the survey e.g. formal cognitive interviewing may have been methodologically valuable in its development²⁵. In the future, more detailed and purpose-designed studies to enable deeper exploration of this area may also be valuable, which would facilitate inferential analyses.

A notable strength of this study is the use of sustained, multiple, and diverse routes of dissemination for maximising awareness and completion amongst the target population during the survey period, spanning clinical, research and professional remits. This approach was essential given the absence of a formal central registry for identifying potential respondents. Nonetheless lack of an accurate respondent denominator precludes determining an overall response level, and consequently may challenge the representativeness of findings. Determining the size of the UK critical care physiotherapy workforce is challenging. Health and Care Professions Council (<http://www.hcpc-uk.org/aboutregistration/professions/index.asp?id=11#profDetails>) and NHS Workforce (<https://data.gov.uk/dataset/nhs-workforce-non-medical-staff>) data lack specialty-specific granularity to provide meaningful estimates. National critical care staffing recommendations advise

at least 1 whole-time-equivalent physiotherapist to every 4 critical care beds²⁶. Using bed capacity data (n=3536, as of April 2017²⁷), would suggest a potential sample of 884 UK critical care physiotherapists, albeit these recommendations are not routinely adopted in practice and therefore this may be an over-estimation. To provide some perspective the response level is more than four times the number of physiotherapy members in the UK Intensive Care Society (n=60)²⁸, and is estimated to reflect critical care membership within the Association of Chartered Physiotherapists in Respiratory Care (Personal Communication; 2017 membership 1050, assuming equal distribution across the four core areas of critical care, surgery, long-term conditions and paediatrics (<http://www.acprc.org.uk/>). Our individual national response levels also closely align with national population levels suggesting the findings reflect the geographical spread of UK critical care physiotherapists (<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/latest>). However in the future it may be beneficial to explore any potential differences between nations in the context of specific detail of critical care service provision. It is possible that missing data to questions, whilst overall very low, may have been skewed by the relative proportions of responses which should be considered when interpreting results e.g. defining future training needs. Furthermore all available opportunities for targeting respondents were adopted, and the achieved response level has provided adequate data to answer the original study aims with consistent themes arising from the data. However as with all surveys there is potential for inherent self-selection and response bias and there are no formal means of assessing degree of non-response and/or any differences between characteristics of responders versus non-responders^{29 30}.

Choice of online survey completion via electronic link versus alternative routes such as postal, was also pragmatic in light of lack of contact details for potential respondents. A four week follow-up period following official closure of the survey was included to contact respondents to obtain missing data, a challenge to all survey studies regardless of interface, and within the current sample the overall proportion of missing data was low (<8%). This survey primarily targeted clinical rather than academic critical care physiotherapists albeit responses from these individuals were not specifically excluded but nor were avenues of survey promotion or dissemination via academic organisational routes pursued; ultimately a very small proportion of respondents indicated they were based in University settings. In the future specifically targeting/including academic clinicians may provide valuable information as their experience of engagement in critical care research may differ due to

context and environment which may have been missed in the current results. That said, similar challenges around determining an accurate denominator for these individuals may still exist.

Importantly the definition of a 'critical care physiotherapist' was open to individual interpretation to maximise volume and breadth of response level. This was not restricted to any acuity of healthcare setting recognising that research with critically ill patients may transition clinical environments, be irrespective of levels of care³¹, and indeed continue beyond the acute hospitalisation period. However it is acknowledged that in the latter stages of recovery physiotherapists from other specialist areas may become involved in delivery of services to post critical illness patients, and they may not have responded to a survey targeted at 'critical care' physiotherapists. In addition, physiotherapists in both the adult and paediatric sector were eligible to respond and from all clinical grades of seniority to maximise representativeness. Furthermore, a broader definition of the term 'research' was adopted to encompass clinical audit, service evaluations and quality improvements to capture data on all activities that clinicians may be involved in and utilise broad research-based skills. Again, this approach helps to consider translation of the findings to other non-physiotherapy professions where involvement in this range of activities may occur. Finally, as with all survey data, the findings are relative to the survey period and it is acknowledged that additional numbers of clinicians may have attained postgraduate qualifications or involvement in research in the interim period from survey conduct to publication of results.

CONCLUSION

UK critical care physiotherapists have skill and experience in many aspects of research. A large number have postgraduate qualifications, including those indicating a defined academic research path. Nonetheless wide-ranging training needs and notable barriers preclude further involvement. These data may help inform approaches to harness the unique skills of this profession to enhance the quality, quantity and scope of critical care clinical research to maximize patient benefit, within a multi-professional national clinical research network, and may have international applicability.

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TABLES

Table 1. Demographic data for survey respondents.

Characteristic	Respondents (n=268)
Employment organisation	
University-affiliated hospital	133 (49.6)
District general hospital	111 (41.4)
Other – Specialist centre	10 (3.7)
– Unclassified	8 (3.0)
– University	5 (1.9)
– Community	1 (0.4)
Location	
England	234 (87.3)
Scotland	16 (6.0)
Wales	12 (4.5)
Northern Ireland	6 (2.2)
Grade of seniority [^]	
5	10 (3.7)
6	73 (27.2)
7	127 (47.4)
8a	36 (13.4)
8b	4 (1.5)
Other (not specified)	5 (1.9)
Not given	13 (4.9)
Postgraduate qualification [#]	
Master of Science	80 (29.9)
Master's level module	66 (24.6)
PG Certificate	37 (13.8)
PG Diploma	21 (7.8)
Master of Research	10 (3.7)
None	9 (3.4)
PhD	7 (2.6)
Professional Doctorate	0
Other*	35 (13.1)
Funding source [#]	
Local organisation	132 (49.3)
Self-funded	73 (27.2)
Established funding pathway	29 (10.8)
Professional body	15 (5.6)
Other~	4 (1.5)

Data reported as n (%). [^] indicated UK Agenda for Change pay structure for allied health professionals; higher numbers (and consecutive letters) indicate more senior, specialist clinical grades. [#] indicates counts representing frequency of occurrence where multiple options

could be selected, and totals will exceed 268 (100%). * 'Other' categories include: Currently undertaking a postgraduate qualification (MSc, PhD, MRes), n=14; Miscellaneous mix, n=7; Leadership/Education qualification, n=6; Prescribing qualification, n=3; Pre-registration MSc, n=3. ~ 'Other' categories include: Charity, n=3; Specialist Interest Group, n=1

Table 2. Previous or current research activity experience of respondents

Research activity	Responses*
Data acquisition/completion of outcomes measures or assessments	144 (53.7)
Protocol development	119 (44.4)
Recruitment and consent	82 (30.6)
Statistical analysis and data interpretation	81 (30.2)
Intervention delivery	75 (28.0)
Database management	69 (26.8)
Patient and public involvement and engagement	68 (25.4)
Ethics/Research and Development approvals application process	64 (23.9)
Manuscript preparation/writing	63 (23.5)
Screening for eligibility	60 (22.4)
Completion of study case report forms	46 (17.2)
None	17 (6.3)

* Date reported as n (%). N=268, n=257 respondents, n=11 missing data. Multiple options permitted per respondent

Table 3. Research training needs of respondents

Research training need	Responses*
Statistical analysis	132 (49.3)
Research methods	122 (45.5)
Protocol development	121 (45.1)
Critical appraisal of literature	119 (44.4)
Applying for grant funding	101 (37.7)
Mentorship	96 (35.8)
Ethics/Research & Development application process	96 (35.8)
Data management	96 (35.8)
Writing a manuscript for publication	92 (34.3)
Systematic review/meta-analysis/synthesis	91 (34.0)
Applying for individual funding	85 (31.7)
Writing a scientific abstract	82 (30.6)
Research team collaboration	69 (25.7)
Recruitment and consent	45 (16.8)
Epidemiology	41 (15.3)

Data reported as n (%). N=268, n=223 respondents, n=17 missing data, n=28 reporting no research training required and not categorised

Table 4. Barriers and enablers to physiotherapy involvement in critical care research

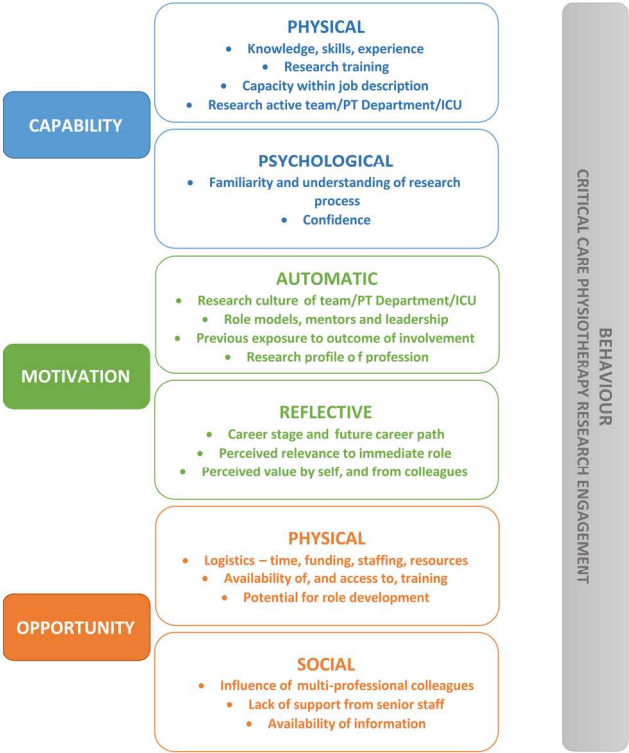
Barrier	Responses*
Lack of protected time	220 (82.1)
Lack of funding	177 (66.0)
Lack of experience	151 (56.3)
No critical care-related research conducted in Physiotherapy Department	110 (41.0)
Lack of confidence	110 (41.0)
Insufficient skill set	97 (36.2)
Unsure what opportunities are available and/or unsure who to approach to find out	96 (35.8)
Lack of support from senior staff/management	86 (32.1)
Insufficient knowledge base	69 (25.7)
No research currently conducted in Critical Care Department	68 (25.3)
Clinical rotations too short to allow involvement	35 (13.1)
Enabler	
Greater information about local critical care physiotherapy studies	185 (69.0)
Wider advertising of opportunities for involvement	153 (57.1)
Increased access to research training	150 (56.0)
Creation of secondment positions into research teams	150 (56.0)
Greater information about local critical care studies	149 (55.6)
National physiotherapy network to link research-active critical care physiotherapists	147 (54.9)
Increased engagement at senior staff/management level	120 (44.8)
Creation of combined clinical-academic positions	114 (42.5)
Greater familiarity/understanding of available funding sources	114 (42.5)
Greater support from Critical Care colleagues e.g. intensivists	102 (37.1)
Knowledge of key contacts within local organisation	84 (31.3)
Option for including as a rotational objective	66 (24.6)

* Data reported as n (%). N=268; n=244 respondents, n=24 missing data; enablers, n=247 respondents, n=21 missing data

FIGURES

Figure 1. Influencing factors contributing to critical care physiotherapists' involvement in research mapped to the COM-B model¹⁵

Abbreviations: PT = physiotherapy. ICU = intensive care unit



Influencing factors contributing to critical care physiotherapists' involvement in research mapped to the COM-B model

197x160mm (300 x 300 DPI)

Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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SUPPLEMENTAL INFORMATION

E1. Research survey

The below is a Microsoft Office Word version of the survey uploaded onto an electronic server for online completion (note formatting changes between differing interfaces).

Section 1. INTRODUCTION

You are invited to participate in this survey to describe the current research skills profile and training needs of UK critical care physiotherapists. This survey is designed for completion by **all** critical care physiotherapists, regardless of research experience to help inform our understanding of this subject. In particular the survey will collect data on postgraduate research qualifications, research experience, resources to enhance research skills and training, and perceived barriers to engagement with research.

If you have any questions relating to the survey or its completion, please contact

Dr. Bronwen Connolly at Bronwen.connolly@nhs.net.

Your participation is highly valued, and we thank you for your time. Please note that once you commence the survey you will not be able to return at a later date to complete it. Pilot testing of the survey indicates it takes approximately 10 minutes to complete – therefore please ensure you have this time available to complete the survey in its entirety.

Thankyou for your consideration and participation

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Dr. Bronwen Connolly, on behalf of the NIHR Critical Care Speciality Group

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Section 2. BACKGROUND

- 1. Participant name (optional)
- 2. Email address for future contact (optional)
- 3. Current job title (free text box)
- 4. Type of employment institution:
 - University hospital
 - DGH
- 5. Location:
 - England
 - Wales
 - Northern Ireland
 - Scotland
- 6. Current Agenda for Change grade (free text box)
- 7. How many years qualified (free text box)
- 8. How many years in current post (free text box)
- 9. Have you undertaken any of the following (tick all that apply):
 - PhD
 - Professional Doctorate
 - Master of Science
 - Master of Research
 - Master's level module (stand alone)
 - Post-graduate Diploma
 - Post-graduate Certificate
 - Other academic qualification (please specify)
- 10. Funding source:
 - Self-funded
 - Local funding
 - NIHR pathway

Other (please specify)

(if more than one award applied, please complete for most recent award and state which this is)

Section 3. RESEARCH EXPERIENCE

11. Which statement(s) best describe your existing research experience (please tick all that apply)

I have completed a dedicated postgraduate research qualification e.g. MRes, PhD

I have a first author publication

I have a co-author research publication

I have submitted/presented a conference abstract/poster/presentation

I have had active involvement in a multi-centre study e.g. recruitment, data collection

I have had active involvement in a single-centre study e.g. recruitment, data collection

I have participated in local or regional audit or service evaluation

I have attended a research-related course

None at all

Other (please comment)

12. Are you currently involved in research: YES/NO

If YES, in what capacity:

Chief Investigator of a study

Principal Investigator of a study

Co-investigator of a study

Research physiotherapist/assistant

Other (please specify)

If YES, please indicate the type of study:

Randomised controlled trial

Non-randomised controlled trial

Observational study

Feasibility study

Epidemiological study

Qualitative study

If YES, is the study commercially funded: YES/NO

13. What research activities have you previously or currently experience of:

(tick all that apply)

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- Protocol development
- Patient and public involvement in research study
- Ethics and R&D approvals application process
- Screening for eligibility
- Recruitment and consent
- Completion of case report forms
- Data acquisition/completion of outcome assessments
- Intervention delivery
- Database management
- Data analysis
- Manuscript preparation
- Other

14. Have you undertaken Good Clinical Practice training:
- Yes
 - No, I wanted to but could not access it
 - No, but I am scheduled to attend
 - No, I don't feel this is necessary
 - No, I don't know what this is
15. How much of your time is currently spent in research (report in hours/week or %WTE)
16. How is this research time funded:
- Costed as part of research study
 - Individual funding pathway e.g. NIHR
 - Established component of current clinical position
 - Unfunded, conducted during existing clinical position
 - Not funded, conducted in own time

Section 4. RESEARCH TRAINING OPTIONS

17. What research training topics/resources would you like available:
- Research methods
 - Epidemiology
 - Critical appraisal
 - Protocol development
 - Data management
 - Statistical analysis

- Research team collaboration
- Ethics and R&D approval processes
- Writing a scientific abstract
- Writing a manuscript for publication
- Applying for grant funding
- Applying for research agency fellowships e.g. NIHR, Health and Care Research Wales or other devolved nation-specific
- Mentorship
- Systematic review/meta-analysis/meta-synthesis
- Consent
- Other (please specify)

18. How would you like these delivered:

- One day course/workshop
- Half day course/workshop
- Evening course/workshop
- Weekday
- Online
- Other (please specify)

Section 5. BARRIERS TO RESEARCH ENGAGEMENT

19. If you are not currently involved in research, would you like to be (in any capacity):

YES/NO

20. Select any barriers you identify to participating in research:

- Insufficient skill set
- Insufficient knowledge base
- Research not happening in local critical care
- Unfamiliar with critical care research happening in local physiotherapy
- Department
- Not sure what opportunities are available
- Rotations too short to complete a project
- Don't know how to find out about research/who to approach
- Lack of time
- Lack of funding
- Lack of support from senior staff/management

- Lack of confidence
- Lack of experience
- No barriers identified

21. What opportunities would you like to get involved with:

- Patient screening for eligibility
- Recruitment and consent
- Data collection and recording
- Data analysis and interpretation
- Abstract writing for conference submission
- Manuscript writing for publication
- Poster or other presentation opportunities
- Orchestrating own project (protocol development, grant preparation etc)
- I am not interested in any research opportunities
- Other (please specify)

22. What initiatives do you think may help improve physiotherapy involvement in critical care research:

- Greater information about local critical care research studies
- Greater information about local critical care physiotherapy research
- Clear opportunities for involvement
- Increased engagement at managerial level for undertaking research qualifications/integrating research into existing roles
- Recognized rotational objective
- Increased access to research training opportunities
- Creation of combined clinical-academic positions
- Creation of secondment positions into research teams
- Greater familiarity with funding opportunities
- Knowledge of key contacts within local organization
- National physiotherapy network to link research-active physiotherapists
- Other (please specify)

Please feel free to add any additional comments or suggestions regarding any aspect of this questionnaire

E2. Free-text comments for 'Research training needs'

Additional free-text comments that respondents provided in response to identifying research training needs, and additional topics from them, are summarised in Table E1. Some respondents suggested that the skills necessary to complete research were often found within clinical Masters' programmes, but there was a frequent request for refreshers and updates in research methods for those who had completed training but been unable to maintain skills. Importantly, some participants highlighted that even with training available, there needed to be support to release staff for training to prevent understaffing and clinical workloads from taking priority.

A number of free-text comments mirrored those already provided as response options to this question e.g. writing a manuscript for publication, statistical analysis. Others were identified as barriers (e.g. lack of protected time for research) or enablers (e.g. peer support in the workplace) to engagement in research that linked to comment made in response to the subsequent question.

Table E1. Analysis of free-text comments regarding research training needs

Qualitative comment	Theme
<i>"Not sure Interest would depend on activity and needs at the time the training is available. Also level of training"</i>	None
<i>"actually probably a bit of everything, I have attempted to write a paper twice, one I submitted but it got turned down, and then I gave up as it takes so much of your own time to sort."</i>	Writing a manuscript for publication*
<i>"Nobody has any time or staffing to release to research unless your job was a research job. Training in this subject is so important however, I think we all leave it to someone else who has the connections, expertise and time."</i>	None (Barrier of 'Lack of protected time')
<i>"I am fortunate to have existing experience developed across a number of these areas through my research positions to date, and have access to all training required. I think there should be availability of all these topics though for those that require additional support and/or have more limited access."</i>	None (Enabler of 'Increased general availability of all aspects of research training')
<i>"I think all these aspects are worthy of inclusion but have answered the question based on my own perceived level of knowledge I feel confident with. Statistical analysis topics should be aimed at the 'non fluff' type of stats. Possibly those types of stats that those even with minimal experience of the research process could understand. Great for journal clubs etc, to prevent glossing over the results sections of papers!! My choice as a starter would be: correlations agreement analyses parametric/ non parametric stats (basics) and how you determine what methods to use data presentation"</i>	Statistical analysis*
<i>"most of the above topics that I have not ticked were available in the research methods module of my MSc"</i>	None
<i>"I am only 4 years from retirement, so prefer to support others in research as much as I am able."</i>	None (Enabler of 'Peer support in the workplace')
<i>"It would be good for these to be readily available but at present I am not interested in carrying out any research"</i>	None
<i>"Having never done any proper "research" since my dissertation which was a literature review, I wouldn't know where to start! I've just picked a few."</i>	None
<i>"A lot of the topics are covered through MSc or similar levels of post grad education."</i>	None
<i>"I have had training on these topics through my research methods module in preparation for my Masters research project but research is not something I feel knowledgeable in or feel particularly passionate about. Hence more reinforcement would be useful in improving my confidence undertaking research in future."</i>	None (Enabler of 'Research awareness')
<i>"already had them - but can't have them enough / refreshers useful"</i>	None (Format of delivery of 'Refresher' courses)

<i>"Would love to get into research, but after 3 masters modules, have found it challenging to find the exact Masters which offers the best options/ fit areas of interest in one particular masters, (also in an accessible position). It is also challenging to find support for this, both financially and time wise (difficult to get study leave for full modules). Also challenging mentally to complete both MSc part time and full time job, without becoming burnt out. Not really enough opportunities for merging the two for therapists, but lots for nursing staff."</i>	None (Barrier of 'Lack of protected time' and 'Lack of funding'; Enabler of 'Creation of clinical-academic positions')
<i>"due to time constraints secondary to staffing levels and current workload - I do not feel I could take on any additional work"</i>	None
<i>"Any training would be beneficial. However the opportunity to network and learn about projects elsewhere that it might be possible to be part of would be of great interest."</i>	None (Enabler of 'Networking and collaboration')
<i>"All of the above but those selected would be the highest priority"</i>	None

*existing response option in original question

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E2. Free-text comments for ‘Barriers and enablers to research engagement’

Additional free-text comments that respondents provided in response to identifying barriers and enablers to physiotherapy engagement in critical care research, and further themes identified from them, are summarised in Table E2.

Lack of protected time and funding were emphasised as barriers, in keeping with the high response levels (82.1% and 66.0% respectively) to those specific response options in the main question. Lack of support from senior management also featured strongly in comments, again a barrier echoed from the existing response options.

New themes identified in the free text comments could be divided into two categories:

- i) Profile of research within the physiotherapy profession including issues such as:
 - a. a lack of research ‘culture’ within physiotherapy,
 - b. a lack of integration of research within clinical roles,
 - c. a lack of defined job specification for those whose clinicians whose roles involve a research component e.g. the proportion of time assigned for research.
- ii) Profile of physiotherapists within the research community:
 - a. Lack of physiotherapy-specific research posts
 - b. Research posts being advertised to nurses specifically, rather than the wider MDT

With regard enablers to physiotherapy engagement in research, free text comments often centred on removal of barriers i.e. more protected time, greater funding rather than ‘new’ strategies per se. There was enthusiasm for the combined role of clinical academics, and suggestions that opportunities to be involved with, but not necessarily lead, research would be valuable.

Table E2. Analysis of free-text comments regarding barriers and enablers to physiotherapy engagement in critical care research

Qualitative comment	Theme
BARRIERS	
<i>"I am a band 5 who has never been on critical care before so I am spending all my time learning the area and would have no time for research"</i>	Need to prioritise acquisition of clinical skills for junior staff
<i>"The perception that this is difficult to achieve with patient caseload, rotational staff teaching with current resources"</i>	Lack of protected time*
<i>"Carry out audits and service development need direction with regards writing up for publication/conference presentation"</i>	Insufficient skill set*
<i>"supportive boss but all about time management with not enough staff"</i>	Lack of protected time* Lack of staffing
<i>"Most critical care research is via big studies that involve nurse participation not therapies. Since I qualified 20 years ago, I can't think of any research opportunities involving therapies in our Trust. It all seems to be Consultant and Nurse participation. There is probably good reasons for this ? due to the huge amount of variables or jobs available in research. On my Critical care unit, there is a specific team of 2 nurses who are employed to collect data and enrol into studies. They have the opportunity to write or be co-writers in studies"</i>	No/minimal opportunities for PT to be involved with research
<i>"Undertook my MSc a long time ago - graduated 2005 after many years struggling to undertake each component with no support and minimal funding. Since then, staffing pressures and changing roles have meant that no further research activities have been undertaken. I do think that the current climate is now much more positive towards research, but I suppose I now feel I have become out-of-date and lost confidence in myself in this respect. Funding is also a major issue."</i>	Lack of support from senior staff/management* Lack of protected time* Insufficient skill set* (need for refresher courses) Lack of funding* Lack of staffing
<i>"No specific research posts - impossible to be a clinician, manager and educator plus a researcher. Unfortunately research is not a priority when you are not employed to do research".</i>	Lack of protected time* Lack of research posts
<i>"Only funding streams in our trust are currently through the NIHR and rely on backfill which then limits ability to apply. Also then pushed to follow career pathway of NIHR which may not be for everybody. Limited other options to access funding to complete research as part of clinical role and above options take you away from clinical practice. Also limited funding / study leave support to embark on a masters".</i>	Lack of funding* Lack of diversity in funding stream Lack of support from senior staff/management* Lack of integration of research in role
<i>"Lack of time to complete research on top of clinical case load. "</i>	Lack of protected time*

<i>"Clinical priorities are paramount. Poor understanding of the benefits of physiotherapist involvement in research at a departmental managerial level. No push for publications/ posters etc. Research pathway not integrated into job roles (i.e. no dedicated time although research priorities in job description). Reluctance to support applications - even when funding is available because there is perceived difficulty in getting backfill. "</i>	<i>Lack of protected time*</i> <i>Lack of support from senior staff/management*</i> <i>Lack of recognition for PT role in research</i> <i>Lack of integration of research in role</i>
<i>"Although I have carried out research and am currently involved in a qualitative project I find it difficult to keep my skills updated and the opportunities for involvement in projects is not easy to access."</i>	<i>Unsure what opportunities are available and/or unsure who to approach to find out*</i> <i>Difficult to maintain skills</i>
<i>"No previous experience to research within clinical field therefore confidence and knowledge biggest personal barriers"</i>	<i>Lack of experience*</i> <i>Lack of confidence*</i>
<i>"This research needs to be set up and encouraged by senior therapists and clinical specialists and then filtered down. If this is not happening at your area of work then it's very difficult for rotational staff to be involved"</i>	<i>Lack of structure/culture for research in PT departments</i>
<i>"Above ticked boxes refer to own personal insufficient skill set/experience/knowledge/confidence, with support from seniors currently I am able to take part in research and develop on these. Due to the dynamic nature of critical care it can be difficult to maintain protected time to complete research/project related work. "</i>	<i>Lack of protected time*</i>
<i>"Within my organisation there is a lack of role model or leadership in research. None of our Clinical Specialists/ Leads (including those from outside of Critical Care) have ever been involved in research and many do not even have a Masters. There is a lack of research culture within my Therapies Department and therefore no one to set a benchmark or to guide others. Also, research is time consuming and funding just isn't there. "</i>	<i>Lack of structure/culture for research in PT departments</i> <i>Lack of protected time*</i> <i>Lack of funding*</i>
<i>"Lack of protected time is the main problem. Even if research responsibilities are part of a JD, there is no system to allow protected time (e.g. research PAs as per Drs job plans). In addition the funding does not necessarily cover clinical grades >8a, which tend to have research written in to a JD. Research opportunities tend to be as part of academic qualifications (MSc/MRes/MPhil/PhD) or discrete projects embedded within academic career pathways (Fellowships etc). It feels as though there is little real opportunity to combine clinical and research activity within a clinical career pathway, whereby research physiotherapist posts or research PAs are embedded as part of clinical services (as is the case for research nurses or Drs). It seems to me that physiotherapists are faced with one of two choices a clinical career or and academic career. Funding and career pathways for physiotherapists need to be reviewed to allow physiotherapists to continue to practice clinically with research embedded as part of a clinical service. Ultimately, we are at risk of siphoning off skilled clinicians in to academia or limiting the opportunity for those with newly developed (through the existing NIHR opportunities) or with established research skills to apply those skills within clinical services. Either way the concept of research embedded in frontline services and led by frontline staff is hard to realise for Physiotherapists"</i>	<i>Lack of protected time*</i> <i>Lack of funding*</i> <i>Lack of integration of research in role</i>

<i>"lack of time and motivation due to poor staffing levels and current workload"</i>	Lack of protected time* Short staffing
<i>"Despite an MSc in Advanced Practice, and performing extended roles, I have never been able to negotiate any extra banding. I am reluctant to keep extending my skills when it is clear there will be no extra remuneration or opportunities for higher grade. I shouldn't be performing band 8 roles for band 7 salary"</i>	Lack of financial incentives/reward for extended skills
<i>"I will be moving back to my post in critical care and would be very keen to carry out research into prehab for our OG pts but am having difficulty knowing where to start who to approach. Have a wee team who are keen to assist but don't know how to take it forward"</i>	Unsure what opportunities are available and/or unsure who to approach to find out* Lack of experience*
<i>"There is a definite lack of support for research or the importance of research even though this could take the form of audits and service evaluation. No time however is available for these things so this would have to be undertaken in our own time. I am also rotational so 9 months does not allow time to develop projects and ideas so for me lack of static posts within critical care/career progression is a particular barrier. There is research happening within the critical care unit but this is medical focused and there are no physios involved only research nurses."</i>	Lack of support from senior staff /management* Clinical rotations too short to allow involvement* Lack of recognition for PT role in research Lack of structure/culture for research in PT departments
<i>"In our current situation the clinical caseload takes priority over all 'non-essential activities' and sadly research is viewed as non-essential"</i>	Lack of protected time*
ENABLERS	
<i>"I think one of the issues is the complexity of carrying out research in this area. I think clinical staff should be encouraged to do more service improvement initiatives and publish their findings. Training on this would be really useful and potentially more applicable in many roles."</i>	Increased access to research training*
<i>"More of a profile, highlighting therapists' knowledge and skills in research. More protected time or secondment time. Time to write review and research interventions. Post grad courses on how to get your foot in the door how to be recognised, how to link and network and understand the statistical jargon."</i>	Need to increase PT research profile Need for protected time Increased access to research training
<i>"Nearly all of the above for me. Getting some into practice, without established research units and staffing being the way it is will be a significant challenge (e.g. rotational objectives). Would be good though!"</i>	BARRIERS: Poor staffing, clinical rotations too short to allow involvement*, lack of structure/culture for research in PT departments
<i>"Time to participate"</i>	Need for protected time

<i>"Support from physio managers re staffing and time. We are already understaffed for 5 days but providing a 6-day service can't fit any more in the week."</i>	Need for protected time Need for improved staffing
<i>"The only Physios I know who do research in critical care are 'research physios', I think that by developing combined clinical-academic roles it would help more staff to appreciate that being involved in research is achievable within their current role."</i>	Creation of combined clinical-academic positions*
<i>"Multicentre studies with lead from external researcher from within a culture and structure (with support) of a research centre"</i>	Opportunities to be involved with, but not lead, research
<i>"Any more support would be helpful. A large limitation is the caseload requirement. We have guidelines on WTE/bed and guidelines on access to Physiotherapy from ICS and NICE etc but there is nothing locally/nationally about protecting posts or having specific research descriptions/no. of hours within posts - this would help."</i>	Guidance on research infrastructure
<i>"Being aware of tangible outcomes/improvements from the research, being able to apply and improve practice as a result."</i>	Improved dissemination and implementation of research findings
<i>"I do not wish my comments to appear negative but as a small District General with less than 100 beds we are using our HDU as a step up facility rather than the level 3 it used to be. Our staffing levels are very low and although I would have liked to be involved with research, it would always have been at the sacrifice of patients' treatments, i.e. no ring-fenced time."</i>	Barrier: lack of protected time*
<i>"I feel that mostly critical care colleagues value physiotherapists and their contribution to research within units, however, I don't feel they have an appreciation of the requirement of PT departments / directorates to develop and deliver their own research strategies and agendas, both professionally and to meet organisational objectives. This may then create tension in terms of priority and support for physiotherapy led research within the critical care setting, with competing priorities."</i>	New barrier theme: lack of structure/culture for research in PT departments
<i>"Networks are key and the opportunity to link in/join networks should be simple and widely advertised."</i>	National PT network to link research-active critical care physiotherapists*
<i>"I have great support from ICU consultants. My concern is if I step out into a research post I am not guaranteed that I will get my old post back when the research/ secondment is finished"</i>	Greater support from Critical Care colleagues e.g. intensivists* New barrier theme: lack of job stability in research
<i>"Would love a clinical-academic position!"</i>	Creation of combined clinical-academic positions*
<i>"I think that greater information about local physio studies would then increase confidence to be able to take this experience back to our own hospitals. Within large physiotherapy studies whether it would be possible to spend a day with the research teams to get an idea of what goes on etc?"</i>	Greater information about local critical care physiotherapy studies* Opportunities for visits to research teams
<i>"Our intensivists are very supportive of research and audit but from a therapies point of view our clinical caseload could not be impacted upon meaning the majority of training/research would have to be in own time"</i>	Greater support from Critical Care colleagues e.g. intensivists* Barrier: lack of protected time*

*existing response option in original question. Abbreviations: PT = physiotherapy

E3. Free-text comments regarding other research opportunities and any other aspect of the survey

Enthusiasm about involvement across research activities was expressed (Table E3), with several participants expressing that they wanted to be involved with 'anything'. There were also a few suggestions that small steps towards research involvement might be useful – such as how to support others in research and support to be a co-investigator rather than leading on a project. Analysis of overall comments from respondents regarding any aspect of the survey are presented in Table E4.

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Table E3. Analysis of free-text comments regarding other research activities to engage with

Qualitative comment	Theme
<i>"already happily/actively involved"</i>	Already involved
<i>"I'm already involved with all of the above"</i>	Already involved
<i>"I would like to get involved with any research opportunities"</i>	Anything
<i>"Not applicable as I am currently in a full time research position"</i>	Already involved
<i>"I am already involved in these activities but also interested in collaborations"</i>	Already involved Collaborations
<i>"Time to think about research"</i>	Protected time*
<i>"I would be happy to be involved in the intervention part of a research project"</i>	Delivering interventions
<i>"Already involved"</i>	Already involved
<i>"Due to barriers don't think I have the capacity to be involved"</i>	None – too many barriers
<i>"Any Physiotherapy relevant research!!! "</i>	Anything
<i>"already research active"</i>	Already involved
<i>" Any opportunity welcomed"</i>	Anything
<i>"I am heading towards the end of my career and the constant staff shortage and increase in Mandatory training for staff means that any involvement in research would be impossible"</i>	None – too many barriers
<i>"Supporting others interested in research"</i>	Supportive role for others (mentorship)*
<i>"I might be interested in research if I had a mentor or guidance. Even to be a co-author or co-researcher and not necessarily lead a research project myself. If I had more confidence in my abilities and more support perhaps it would be something I could do in future. I have some experience in research having completed a Masters project but I would hesitate to start a big research project on my own"</i>	Support to be a co-investigator (mentorship)*
<i>"I suppose a step back: idea development - with like-minded colleagues, would like to do something PT specific, say rehab effects on VV ECMO, we need multi sites"</i>	National physiotherapy network to link research-active physiotherapists*
<i>"I have the skills to do those research tasks in which I already participate. "</i>	Already involved
<i>"Any opportunities would be welcomed. Also chance to be part of projects going on elsewhere in the area if possible. "</i>	Anything Greater information about local critical care studies*

*existing response option in original question.

Table E4. Analysis of free-text comments regarding any other aspect of the survey

Qualitative comment	Theme
<i>"ICU Physios generally leave ICU as they get older as it's a very physically demanding role - you don't see many ICU fully clinical physios beyond the age of 40. However very few go into research roles, they tend to leave to community jobs or into management. It would be great to influence those in senior ICU roles to be encouraged to take a more active involvement in research as they are clinicians with a wealth of experience. Also a lot of ICU clinical research roles are advertised as nursing roles"</i>	Opportunities for less physically able/older PTs
<i>"We need more of a profile, we are seen as sputum managers and yet our knowledge in anatomy and physiology, rehabilitation, critical illness polymyoneuropathy, neurology, orthopaedics, medical, surgical is often overlooked. In our Trust all our on-call staff rate the critical care unit as a particularly unfriendly place to work. The cultures and perceptions of our role as therapies needs a revamp to be able to include us more in research and development. I would guess we are all keen, just disillusioned by the lack of knowledge and respect critical care staff have regarding therapies and their skills."</i>	Need to increase PT research profile lack of structure/culture for research in physiotherapy departments*
<i>"The PT career pathway needs to be developed like the doctors - they have research/clinical pathways which give the research fellows time to devote their efforts into research and delivery of research finding. PT's on the shop floor can't do that - we are stretched enough and research takes a long time. I have tried and failed"</i>	Need to increase PT research profile* Lack of structure/culture for research in physiotherapy departments*
<i>"Protected time is one of the issues, and guidance or awareness of how to structure research. Identification of support systems would be extremely beneficial."</i>	Lack of protected time* National physiotherapy network to link research-active critical care physiotherapists* Insufficient skill set*
<i>"My research is currently related to simulation on on-call training which does involve critical care patients - it is not necessarily specific purely to critical care patients. As research is written into my job description I am in a position to allocate time to it. I was empowered to protect time - I think all 8a JDs should specifically have an element of research documented in order to empower people to take time in their allocated work time."</i>	Benefit of clear research allocation in job role* Need for role models*
<i>"As the only static PT on critical care in a part time capacity it is difficult to initiate & complete research. My aim is to complete an MSc module as a starting point. I currently undertake Quality Improvement projects / audit however have not undertaken an independent research study & would enjoy working with others at local hospitals to increase confidence to be able to achieve this."</i>	Lack of protected time* Increased access to research training* Greater information about local critical care studies* National physiotherapy network to link of research-active critical care physiotherapists*

<i>"Support from critical care colleagues and Intensivists is strong as there is already an established critical care research profile and often they are keen for physiotherapists to be involved. However, time constraints and clinical priorities are often the main barriers. It would also be very useful to have a database of research active critical care PTs to encourage peer support and collaboration."</i>	National physiotherapy network to link of research-active critical care physiotherapists* Lack of protected time*
<i>"The research culture within critical care physiotherapy teams varies greatly between trusts and clinical areas. It is extremely difficult within my trust to get any protected time to undertake research."</i>	Lack of protected time*
<i>"Time spent towards research is currently limited towards service development projects which lead onto potential abstract submission. In the current climate there does not seem to be enough time to be able to dedicate to going the extra mile with a full research project and currently service development projects are a stretch which is a shame. We aim to have service development/research as a part of the teams objectives to keep things moving forwards but these are tending to take longer to achieve due to staffing shortages and clinical pressures"</i>	Lack of protected time* Lack of staffing
<i>"At this moment in time, I am not interested in participating in research due to other large projects at work and young family at home. I may be in the future. I think having research skills are useful for staff (e.g. critical appraisal, proposal writing, writing up projects) in order to conduct audits and service improvement. I see that staff who have done masters level study are more inclined to lead and participate in service improvement at a physio department / team and at a trust level."</i>	Lifestyle aspects and broader value of research-trained staff in leadership roles etc
<i>"As with everything there is not enough hours in the day to get clinical work done let alone the management service development aspect of job role so being able to even think about doing an research is so far down the priority level it just doesn't get any thought. This in conjunction with not knowing what can be done or how to go about it is a non-starter. "</i>	Lack of protected time* Lack of prioritisation of research Lack of skills*
<i>"I feel my main barriers to research have been: Lack of expertise Lack of dedicated time"</i>	Lack of skills* Lack of protected time*
<i>"The biggest barrier is that-Lack of clear career/ research/professional pathway for our profession eg Drs have a clear professional/ training career pathway which is well supported and resourced!! "</i>	Lack of structure/culture for research in physiotherapy departments*
<i>"Our Unit involved in PRISM, BREATHE, LEOPARDS - anaesthetic lead with dedicated Research nurse. No time within my role to undertake Physio research currently. "</i>	Lack of protected time*
<i>"We need to raise the profile of physiotherapy through research. I have lots of ideas but have been unable to carry them through due to some of the reasons listed above, and now my consultants are moving on with the ideas"</i>	Need to increase PT research profile*
<i>"Would like to be involved in research but haven't considered it an option previously. Would be good to see secondment project opportunities or protected research time with clinical hours backfilled"</i>	Lack of structure/culture for research in physiotherapy departments* Need for protected time* with backfill Creation of secondment opportunities into research teams*

"I think this is an excellent idea. There are untapped resources in hospitals outside of the major cities which could add to the weight of evidence of our worth in critical care. We just need the confidence and time to go out and capture it!"

Lack of confidence*

*existing response option in original question.

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CHERRIES Checklist

Characterising the research profile of the critical care physiotherapy workforce and engagement with critical care research: a UK national survey

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