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Translational researchers' training and development needs, preferences, and barriers: A survey in a National Institute for Health Research Biomedical Research Centre in the United Kingdom

Karen Bell[1] | **Syed Ghulam Sarwar Shah**[1,2] | **Lorna R. Henderson**[1,2] | **Vasiliki Kiparoglou**[1,3]

[1]National Institute for Health Research Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust, John Radcliffe Hospital, Oxford, UK

[2]Radcliffe Department of Medicine, Medical Sciences Division, University of Oxford, John Radcliffe Hospital, Oxford, UK

[3]Nuffield Department of Primary Care Health Sciences, University of Oxford, Radcliffe Observatory Quarter, Oxford, UK

Correspondence

Syed Ghulam Sarwar Shah, National Institute for Health Research Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust, John Radcliffe Hospital, Room 4503, Corridor B, Level 4, Headington Way, Headington, Oxford OX3 9DU, UK. Email: sarwar.shah@ouh.nhs.uk

Abstract

The objective was to identify translational researchers' training and development needs, preferences, and barriers to attending training. This cross-sectional study involved an online questionnaire survey. The research population comprised a convenience sample of translational researchers and support staff ($N = 798$) affiliated with the National Institute for Health Research Oxford Biomedical Research Centre. The response rate was 24%. Of 189 respondents, 114 were women (60%) and 75 were men (40%). The respondents were mainly research scientists (31%), medical doctors and dentists (17%), and research nurses and midwives (16%). Many of the respondents had attended at least one training course in the last year (68%). Training in statistics and data analysis was the most common training received (20%). Leadership training was the most wanted training (25%). Morning was the most preferred time of training (60%). Half a day was the ideal duration of a training course (41%). The main teaching hospital site was the most preferred location of training (46%). An interactive workshop was the most favored delivery style of training (52%). Most common barriers to attending training were the lack of time (31%), work (21%) and clinical commitments (19%), and family and child-care responsibilities (14%). Some differences in training needs, preferences, and barriers were found by gender and role, though these were not statistically significant. Translational researchers want short, easily accessible, and interactive training sessions during the working day. The training needs, preferences, and barriers to attending training need to be considered while developing inclusive training programs in biomedical research settings.

Karen Bell and Syed Ghulam Sarwar Shah are joint first authors on this work.

Study Highlights

WHAT IS THE CURRENT KNOWLEDGE ON THE TOPIC?
Training and continuing professional development of translational researchers is critical for research and innovation in healthcare, improving patient care, and career advancement.

WHAT QUESTION DID THIS STUDY ADDRESS?
We studied the training and development needs and preferences of translational researchers and research support staff as well as barriers they encounter in attending training.

WHAT DOES THIS STUDY ADD TO OUR KNOWLEDGE?
In translational research settings, clinical researchers and research support staff prefer short and interactive training sessions in a convenient location during the working day, preferably in the morning for half a day. Translational researchers want training in leadership, research grant and fellowship writing, and statistics and data analysis. Lack of time and clinical commitments are the biggest barriers preventing clinicians and nurses from attending training.

HOW MIGHT THIS CHANGE CLINICAL PHARMACOLOGY OR TRANSLATIONAL SCIENCE?
Translational research organizations should develop training programs that must consider training location, timing, and duration that suit clinicians, nurses, and other health professionals who work in very busy and highly demanding clinical settings. In addition, trainees' gender, physical limitations, childcare and family commitments, and especially professional roles are also important factors to consider in developing inclusive training programs.

INTRODUCTION

In the United Kingdom (UK), the National Institute for Health Research (NIHR) Biomedical Research Centres (BRCs) are part of the Government's initiative to improve the translation of basic scientific developments into clinical benefits for patients and to reinforce the position of the country as a global leader in healthcare related research.[1] A review of the NIHR training program[1] found that there was a need to develop innovative approaches to train the translational research workforce of the future, and to develop their career pathways as the clinical and translational research environment is changing rapidly. Training is vital to maintain a skilled workforce, as healthcare changes with technological advances and emerging diseases such as coronavirus disease 2019 (COVID-19).[2] It is also a way for individuals to develop their careers, improve confidence, motivation, and ultimately retention.[3] In addition, training and development is essential for improving patient care[4] as well as research and innovation.[5,6] Translational researchers therefore need to be provided with professional and skills development training that not only meets their needs and requirements but is also designed and delivered according to their preferences.[7] Such training programs could help translational researchers enhance their research skills, confidence, and ability to undertake various research-related tasks such as developing study design, data collection and analysis, and synthesis and reporting of research findings.[8]

According to the 2019 Researcher Development Concordat,[9] researchers must be equipped and supported to be adaptable and flexible in an increasingly diverse global research environment and employment market. This Principle recognizes the importance of continuous professional and career development, particularly as researchers pursue a wide range of careers.[9] Most clinical practitioners receive regular professional training such as good clinical practice and obtaining ethical approval, but not leadership training and research skills, which are associated with progression in rank, leadership position, and research publication.[10] It is therefore imperative to know the areas of skills development, preferences for the delivery of training, and barriers to attending training in translational research settings, which involves mostly clinicians and nurses working in very demanding clinical environments.

The primary objective was to identify the training and development experiences, needs, and preferences, as well as barriers to attending training, of translational researchers and research support staff affiliated to one of the largest NIHR BRCs in the UK. The secondary objective was to study whether there were any differences in training

needs, preferences, and barriers based on the gender and role of translational researchers.

METHODS

Study design and setting

This cross-sectional online questionnaire survey was undertaken at the NIHR Oxford Biomedical Research Centre (BRC), which is a partnership that brings together the research expertise of the University of Oxford and the clinical skills of healthcare staff of Oxford University Hospitals National Health Service (NHS) Foundation Trust, with the aim of supporting translational research and innovation to improve healthcare for patients.[11] Founded in 2007, the NIHR Oxford BRC is one of five centres funded by the NIHR and has received over £260 million since its foundation to support translational research. The NIHR Oxford BRC is divided into 20 research themes with over 500 researchers and research support staff supported by the BRC.[11]

The NIHR Oxford BRC's overarching strategy focuses on building capacity with the explicit aim to attract, develop, and retain the best research professionals.[1] First, by providing opportunities for talented healthcare research staff to develop their expertise and skills through higher degrees, as well as via shorter research fellowships. Second, to facilitate the training and engagement in professional development of all its affiliates including researchers and research support staff. The BRC spends in the region of £300,000 a year on training and education for translational researchers and research support staff. This is about 1.3% of its total annual budget of £23 million. On average, about 70 researchers a year benefit from training support which includes providing training bursaries, fellowships, and bespoke courses including leadership, health economics, and grant-writing skills.

The NIHR Oxford BRC works collaboratively with other organizations including the Clinical Research Network, the Oxford Health BRC, and the University of Oxford, that also provide a range of training opportunities for supported staff. In addition, Oxford University Hospitals NHS Foundation Trust provides training for their staff under the Core Skills Training Framework that includes statutory and mandatory training in different areas, such as infection prevention and control, conflict resolution, and safeguarding adults and children.[12]

To plan an effective training and skills development program we sought the views of translational researchers and research support staff within and affiliated to the NIHR Oxford BRC about their training experiences, needs, and preferences, which is imperative according to the Researcher Development Concordat,[9] as well as barriers to attending training courses.

Study population

The study population included anyone involved in translational research and affiliated to the NIHR Oxford BRC. This convenience sample included medical doctors, dentists, nurses, midwives, allied health professionals, clinical scientists, statisticians, software engineers, administrative staff, and clinical trial managers supported directly by the BRC. In addition, we sent the questionnaire to professionals who were involved with translational research but not supported directly by the BRC such as research nurses.

Development of the survey questionnaire

The survey questionnaire was developed and comprised of 10 questions with a mix of multiple-choice questions and free-text answers. These questions asked for participants' gender, role, research theme, training attended in the last year, training found most useful, the most wanted training, the time, duration, location and delivery style of training, and barriers to attending training. Participants were also given an open-ended choice to comment on the training received in the past, including any other aspects of training and development. The questionnaire was intended to be quick and easy to complete while capturing the information required to develop and revamp the BRC's training program that met the training and development needs of translational researchers and research support staff. The questionnaire was developed using the Joint Information Systems Committee (JISC®) online survey software.[13] The questionnaire was piloted with five members of the core administration team of the BRC. The survey questionnaire is available on request from the authors.

Administration of the survey

Using the JISC online surveys,[13] the survey was sent via personalized emails to 798 translational researchers and research support staff associated/affiliated with the NIHR Oxford BRC in October 2019. They were given 2 months to respond, with two reminders. We collated all responses received by December 31, 2019. With the JISC online survey, data were secure and strict information security standards were followed (ISO27001)[14] in compliance with the General Data Protection Regulations.[15]

Data analysis

Data were downloaded from the JISC to the IBM Statistical Package for the Social Sciences (SPSS), version 23.0 for Windows[16] and Microsoft Excel. Data were analyzed for frequencies and descriptive statistics. Differences in training needs, preferences, and barriers by gender and role were determined at two levels: most common and second most common, based on the first and second highest number of responses, respectively, within two categories of gender (i.e., male and female) and six categories of role (i.e., medical doctors/dentists, allied health professionals, research nurses/midwives, research scientists, administrators/managers, and others). For checking any significant differences within genders and within roles, the chi-square test of independence was used. We did not impute missing values or perform sensitivity analyses.

Patient and public involvement

As this study focused on professional training and development needs of translational researchers and research support staff affiliated with the NIHR Oxford BRC, neither patients nor the public were involved in the study.

Reporting checklist

We report this study according to the Consensus-Based Checklist for Reporting of Survey Studies.[17]

Ethics approval

This study was an evaluation of the training and development service. We used the Health Research Authority (HRA) decision tool to gauge if our study required NHS ethics approval. The HRA tool results suggested that our study would not be considered research; hence, NHS ethics approval was not required and obtained. In addition, our retrospective application for ethics approval was reviewed by the Officer of the University of Oxford Medical Sciences Interdivisional Research Ethics Committee (MS IDREC) with reference to formally approved processes and it was determined that the study would be classified as evaluation, rather than research, and therefore did not require ethical review (CUREC Application: R77595/RE001, date August 26, 2021).

RESULTS

The survey was completed by 189 participants. The response rate was 24%. Respondents comprised 114 women (60%) and 75 men (40%). A total of 31% respondents identified themselves as research scientists, medical doctors and dentists (17%), nurses and midwives (16%), administrators and managers (16%), allied health professionals (7%), and others (13%) such as research project managers, data scientists, analysts, and programmers (Table 1). Most medical doctors and dentists, and research scientists were men while research nurses, midwives, and allied health professionals, as well as administrators, managers, and others, were mostly women. The respondents were from all 20 research themes as well as the management team of the NIHR Oxford BRC (Table 1).

Training received in the last year

Over two-thirds of respondents (68%) reported attending at least one training course in the past year. The most common training received was in statistics and data analysis (20%), followed by research methods (19%), statutory and mandatory training (18%), and good clinical practice (16%) (Table 2). Most commonly, women received training in research methods as well as statutory and mandatory training, while the most common types of training received by men were statistics and data analysis training (Table 2). Most frequently, medical doctors and dentists received training in statistics and data analysis as well as good clinical practice training, research nurses and midwives received training in good clinical practice and statutory and mandatory training, administrators and managers received statutory and mandatory training, while research scientists, allied health professionals, and others received training in statistics and data analysis (Table 2).

Training found most valuable

The majority of respondents (58%) reported they valued training particularly in statistics and data analysis (19%), research methods (18%), and ethics and consent (10%), as well as statutory and mandatory training (10%) (Table 2).

By gender, the most valuable training was statistics and data analysis, and research methods training for many female respondents, while statistics and data analysis training was the most valuable training for the majority of male respondents. According to roles, research methods

TABLE 1 Respondents' gender, role, and research theme

Characteristics	Female n	Female %	Male n	Male %	Total n	Total %
Gender	114	60.3	75	39.7	189	100
Role	114	60.3	75	39.7	189	100
Research scientists	23	20.2	36	48.0	59	31.2
Medical doctors/ dentists	11	9.6	21	28.0	32	16.9
Research nurses/ midwives	26	22.8	4	5.3	30	15.9
Administrators/ managers	27	23.7	3	4.0	30	15.9
Allied health professionals	9	7.9	5	6.7	14	7.4
Others[a]	18	15.8	6	8.0	24	12.7
Research theme	112	59.9	75	40.1	187	100
Musculoskeletal	9	8.0	8	10.7	17	9.1
Neurology	10	8.9	6	8.0	16	8.6
Gastroenterology	9	8.0	7	9.3	16	8.6
Vaccines	10	8.9	4	5.3	14	7.5
Cardiovascular	7	6.2	4	5.3	11	5.9
Respiratory	6	5.4	4	5.3	10	5.3
Hematology	6	5.4	4	5.3	10	5.3
Digital health	6	5.4	4	5.3	10	5.3
Genomics	6	5.4	3	4.0	9	4.8
Partnerships for health, wealth, and innovation	4	3.6	4	5.3	8	4.3
Obesity	3	2.7	3	4.0	6	3.2
Multimorbidity	4	3.6	2	2.7	6	3.2
Imaging	1	0.9	5	6.7	6	3.2
Diabetes	5	4.5	1	1.3	6	3.2
Surgery	3	2.7	2	2.7	5	2.7
Stroke	4	3.6	1	1.3	5	2.7
Cancer	3	2.7	2	2.7	5	2.7
Informatics	0	0.0	4	5.3	4	2.1
Molecular diagnostics	2	1.8	1	1.3	3	1.6
Microbiology	0	0.0	1	1.3	1	0.5
Other[b]	14	12.5	5	6.7	19	10.2

[a]Clinician scientist, statistician, laboratory manager/tissue coordinator/ researcher, project manager (research), research coordinator, research operations manager, clinical trials manager, pharmacist, laboratory manager, data manager, computing specialist, data analyst/programmer, research and development operations managers, data scientist, and other.

[b]Biomedical Research Centre (BRC) management team, trust employee, management office; research theme manager; library support, research and development (R&D) manager, R&D finance, BRC administration; research computing, and other.

training was most valuable to the majority of medical doctors and dentists, statutory and mandatory training for research nurses and midwives, and statistics and data analysis training for most of the research scientists, research allied health professionals, administrators, managers, and others (Table 2).

Most important training area

Leadership skills was the most important training area for many respondents irrespective of their gender (25%) (Table 2). Most important training area by role included statistical analysis for medical doctors and dentists, designing and conducting clinical trials and clinical skills for research nurses and midwives, writing research grants and fellowship applications for research scientists and allied health professionals, and leadership skills for administrators, managers, and others (Table 2).

Open-ended comments

In the free-text comments, 44 participants (32 women and 12 men) provided information about why certain training courses were valuable to them (Box 1). These remarks illustrated the usefulness of training. The major themes evident from these comments were the application of training in research work, training tailored to the role, research-related specific training, and training in specialized areas such as clinical, epidemiological, and communication skills (Box 1).

Ideal length of a training course

For most participants, regardless of gender and role, half a day was the perfect length of a training course (41%) (Table 3). The next best duration of a training course included 1–2 h, which was ideal for female respondents and those who were administrators and managers, as well as a full day that was the second best duration of training for male respondents and those who were medical doctors, dentists, allied health professionals, research nurses, and midwives (Table 3).

Preferred time of day for training

Regardless of respondents' gender and role, morning was the most preferred time (60%), and weekends was the least preferred time for training (1%) (Table 3). The second

TABLE 2   Training received in the last year, training found most valuable, and training area most important to development and training needs

Parameter	Total respondents		Gender				Professional role											
			Female		Male		Administrators/ managers		Medical doctors/ dentists		Allied health professionals		Research nurses/ midwives		Research scientists		Others	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Training received (n = 165)																		
Yes[a]	113	68.5	73	64.6	40	35.4	20	17.7	19	16.8	12	10.6	23	20.4	23	20.4	16	14.2
Statistics and data analysis	22	19.5	14	12.4	8	7.1	3	2.7	4	3.5	3	2.7	0	0.0	7	6.2	5	4.4
Research methods	21	18.6	16	14.2	5	4.4	3	2.7	3	2.7	2	1.8	7	6.2	3	2.7	3	2.7
Statutory and mandatory training[b]	20	17.7	16	14.2	4	3.5	4	3.5	2	1.8	1	0.9	8	7.1	2	1.8	3	2.7
Good clinical practice	18	15.9	12	10.6	6	5.3	1	0.9	4	3.5	1	0.9	8	7.1	1	0.9	3	2.7
Degrees, diplomas, and certificate courses	17	15.0	12	10.6	5	4.4	2	1.8	2	1.8	1	0.9	7	6.2	2	1.8	3	2.7
Clinical skills	11	9.7	10	8.8	1	0.9	2	1.8	2	1.8	1	0.9	5	4.4	1	0.9	0	0.0
Ethics and consent	11	9.7	8	7.1	3	2.7	1	0.9	1	0.9	1	0.9	5	4.4		0.0	3	2.7
Leadership skills	10	8.8	4	3.5	6	5.3	2	1.8	2	1.8	2	1.8	1	0.9	3	2.7	0	0.0
Other[c]	29	25.7	19	16.8	10	8.8	6	5.3	3	2.7	3	2.7	5	4.4	10	8.8	2	1.8
No	52	31.5	32	61.5	20	38.5	8	15.4	10	19.2	2	3.8	4	7.7	22	42.3	6	11.5
Training found most valuable (n = 134)																		
Yes[a]	78	58.2	52	66.7	26	33.3	12	15.4	14	17.9	8	10.3	17	21.8	17	21.8	10	12.8
Statistics and data analysis	15	19.2	10	12.8	5	6.4	3	3.8	2	2.6	2	2.6	0	0.0	4	5.1	4	5.1
Research methods	14	17.9	10	12.8	4	5.1	2	2.6	4	5.1	1	1.3	3	3.8	2	2.6	2	2.6
Statutory and mandatory training[b]	8	10.3	7	9.0	1	1.3	1	1.3	0	0.0	0	0.0	4	5.1	2	2.6	1	1.3
Ethics and consent	8	10.3	6	7.7	2	2.6	0	0.0	2	2.6	1	1.3	2	2.6	0	0.0	3	3.8
Degrees, diplomas, and certificate courses	7	9.0	6	7.7	1	1.3	1	1.3	1	1.3	0	0.0	4	5.1	1	1.3	0	0.0
Clinical skills	6	7.7	5	6.4	1	1.3	1	1.3	1	1.3	1	1.3	3	3.8	0	0.0	0	0.0
Leadership skills	6	7.7	1	1.3	5	6.4	1	1.3	1	1.3	1	1.3	0	0.0	3	3.8	0	0.0
Good clinical practice	6	7.7	3	3.8	3	3.8	0	0.0	2	2.6	0	0.0	2	2.6	1	1.3	1	1.3
Other[d]	19	24.4	11	14.1	8	10.3	5	6.4	2	2.6	2	2.6	2	2.6	5	6.4	3	3.8
None/too early to say	4	3.0	3	2.2	1	0.7	1	0.7	2	1.5	0	0	0	0	0	0	1	0.7

TABLE 2 (Continued)

Parameter	Total respondents		Gender				Professional role											
			Female		Male		Administrators/ managers		Medical doctors/ dentists		Allied health professionals		Research nurses/ midwives		Research scientists		Others	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
N/A because no training attended in the last year	52	38.8	32	23.9	20	14.9	8	6	10	7.5	2	1.5	4	3	22	16.4	6	4.5
Most important training area	178	100	105	59.0	73	41.0	25	14.0	32	18.0	12	6.7	28	15.7	59	33.1	22	12.4
Leadership skills	44	24.7	25	14.0	19	10.7	11	6.2	7	3.9	2	1.1	3	1.7	17	9.6	4	2.2
Research grant/fellowship writing	32	18	14	7.9	18	10.1	0	0.0	4	2.2	6	3.4	2	1.1	18	10.1	2	1.1
Statistical analysis	28	15.7	17	9.6	11	6.2	2	1.1	8	4.5	2	1.1	3	1.7	11	6.2	2	1.1
Designing and conducting clinical trials	16	9	8	4.5	8	4.5	2	1.1	6	3.4	0	0.0	10	5.6	0	0.0	1	0.6
Clinical skills[e]	16	9	12	6.7	4	2.2	0	0.0	3	1.7	1	0.6	10	5.6	0	0.0	2	1.1
Research skills[f]	13	7.3	8	4.5	5	2.8	3	1.7	0	0.0	0	0.0	1	0.6	7	3.9	2	1.1
Academic writing	9	5.1	6	3.4	3	1.7	0	0.0	0	0.0	1	0.6	2	1.1	2	1.1	4	2.2
Presentation skills	5	2.8	3	1.7	2	1.1	0	0.0	1	0.6	0	0.0	0	0.0	2	1.1	2	1.1
Other[g]	15	8.4	12	6.7	3	1.7	7	3.9	3	1.7	0	0.0	1	0.6	1	0.6	3	1.7

[a]Respondents reported more than one training episode, both received and useful, so total count is greater than the actual count of respondents and percentages are >100% responses.

[b]Statutory and mandatory training covers different areas such as: conflict resolution, equality, diversity and human rights, fire safety, health, safety and welfare, infection prevention and control, information governance and data security, moving and handling, preventing radicalization, resuscitation, safeguarding adults, safeguarding children.

[c]Anti-bullying/harassment training; office administration; seminars; chemical safety, working with cryogenic liquids, mesoscale discovery machine use; coaching; communications course; dry ice; finance procedures; grant writing; health technology assessment (HTA); IT training; industry networking; introduction to health economics; media training; National Health Services (NHS) Research and Development (R&D) Forum training; Medicines and Healthcare products Regulatory Agency (MHRA) training; new study setups; project management, Microsoft project; public speaking; research monitoring; lectures and workshops.

[d]NHS R&D Forum training; MHRA training, conferences, feedback conversations, grant writing and applications, industry networking, information technology (IT), principal investigator training, project management, public speaking, publishing, supervision, Symplectic training, using equipment for new studies, working groups with others, and workplace coaching.

[e]Good clinical practice, informed consent, and other.

[f]Good research practice, laboratory skills, and other.

[g]Health economics, software and database development, project management, supporting women careers, role-specific training, IT.

BOX 1   **Selected open-ended comments about the usefulness of training received**

Training applicable at work

"The Biomedical Data Science training program was an incredible course, I learned a lot and have been able to apply it to my own data." [Respondent #34, female, research scientist]

Training tailored to the role

"The EMBO [European Molecular Biology Organization] course: 30 hours of high-quality leadership training tailored specifically to my role as a new PI [Principal Investigator]." [Respondent #35, male, research scientist]

"Leadership training SBS [Said Business School] access to wide network of international leaders and techniques to apply to the BRC [Biomedical Research Centre] and make a difference." [Respondent #43, female, manager]

"Information Governance at HTA [Health Technology Assessment] as these are key aspects of my role." [Respondent #150, female, research nurse/midwife]

Research-related specific training

"Clinical Trial [training]...allowed me to run my study more carefully." [Respondent #67, male, medical doctor/dentist]

"Publication schools – excellent and engaging faculty, gained a lot of knowledge about publishing process and the university regulations." [Respondent #47, female, medical doctor/dentist]

"HRA [Health Research Authority] approvals as it was short so able to go in work time and relevant to job." [Respondent #129, female, research nurse/midwife]

"GCP [Good Clinical Practice] update as relevant and practical and opportunity to meet other research staff." [Respondent #134, female, research nurse/midwife]

Training in specialized areas

"Epidemiological assessment of vaccines provided me with knowledge applicable to my current post. Tropical nursing provided me with a wider knowledge of the diseases we are looking vaccines for." [Respondent #78, male, research nurse/midwife]

"The vaccinology courses gave me more knowledge and understanding to work at a higher standard that was required, and the other training was helpful for career progressing." [Respondent #185, female, administrator/ manager]

"Communications course – extremely useful for having difficult conversations." [Respondent# 112, female, medical doctor/dentist]

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most preferred time for training was afternoon for both male and female respondents and for medical doctors, dentists, allied health professionals, and research nurses and midwives, while lunch time was the second most preferred time for training for administrators and managers (Table 3). Research scientists equally preferred whole day and 1–2 h as the second most preferred times for training (Table 3).

Ideal location for training

The main teaching hospital (i.e., John Radcliffe Hospital) was the most preferred location for training (46%), irrespective of respondents' gender and role except research nurses and midwives, while training outside of the city (i.e., Oxford) was the least preferred location (3%), regardless of respondents' gender and role (Table 3).

Preferred delivery style of training

Regardless of respondents' gender and role, an interactive workshop was the most preferred delivery style of training (52%), while a journal club/Discussion was the least preferred (1%) training delivery style (Table 3).

Barriers to attending training

While 37% of respondents did not face any barriers to attending training, 63% of those surveyed encountered different barriers that prevented them from attending training courses (Table 4). The most common reasons for not attending training courses included lack of time (31%), work commitments (21%), clinical commitments (19%), and childcaring and family responsibilities (14%) (Table 4). Both male and female respondents reported a lack of time as the most common barrier; time was also a

TABLE 3 Ideal length of a training course, preferred time of day for training, ideal location for training, and preferred delivery style of training

Parameter	Total respondents		Gender				Professional role											
			Female		Male		Administrators/managers		Medical doctors/dentists		Allied health professionals		Research nurses/midwives		Research scientists		Others	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Ideal length of a training course	180	100	107	59.4	73	40.6	27	15.0	32	17.8	12	6.7	29	16.1	58	32.2	24	13.3
Half a day	74	41.1	45	25.0	29	16.1	7	3.9	12	6.7	5	2.8	17	9.4	23	12.8	10	5.6
Whole day	45	25	22	12.2	23	12.8	4	2.2	11	6.1	4	2.2	6	3.3	16	8.9	4	2.2
1–2 h	40	22.2	25	13.9	15	8.3	8	4.4	6	3.3	2	1.1	3	1.7	16	8.9	5	2.8
2–3 days	11	6.1	8	4.4	3	1.7	3	1.7	3	1.7	0	0.0	1	0.6	2	1.1	2	1.1
Other[a]	10	5.6	7	3.9	3	1.7	5	2.8	0	0.0	1	0.6	2	1.1	1	0.6	1	0.6
Preferred time of day for training	176	100	105	59.7	71	40.3	26	14.8	32	18.2	12	6.8	28	15.9	56	31.8	22	12.5
Morning	105	59.7	66	37.5	39	22.2	17	9.7	13	7.4	8	4.5	21	11.9	30	17.0	16	9.1
Afternoon	39	22.2	19	10.8	20	11.4	1	0.6	10	5.7	2	1.1	5	2.8	18	10.2	3	1.7
Lunchtime	12	6.8	7	4.0	5	2.8	3	1.7	1	0.6	1	0.6	0	0.0	6	3.4	1	0.6
Evening	4	2.3	1	0.6	3	1.7	0	0.0	4	2.3	0	0.0	0	0.0	0	0.0	0	0.0
Weekend	2	1.1	1	0.6	1	0.6	0	0.0	1	0.6	0	0.0	0	0.0	1	0.6	0	0.0
Other[b]	14	8	11	6.3	3	1.7	5	2.8	3	1.7	1	0.6	2	1.1	1	0.6	2	1.1
Ideal location for training	180	100	108	60.0	72	40.0	28	15.6	32	17.8	12	6.7	28	15.6	58	32.2	22	12.2
John Radcliffe Hospital	83	46.1	50	27.8	33	18.3	12	6.7	16	8.9	8	4.4	11	6.1	27	15.0	9	5.0
Old Road Campus/Churchill	49	27.2	27	15.0	22	12.2	3	1.7	7	3.9	2	1.1	13	7.2	17	9.4	7	3.9
Oxford City Centre	22	12.2	14	7.8	8	4.4	7	3.9	2	1.1	1	0.6	0	0.0	9	5.0	3	1.7
Nuffield Orthopaedic Centre	9	5	5	2.8	4	2.2	1	0.6	3	1.7	0	0.0	1	0.6	2	1.1	2	1.1
Outside Oxford	6	3.3	3	1.7	3	1.7	0	0.0	3	1.7	0	0.0	1	0.6	2	1.1	0	0.0
Other[c]	11	6.1	9	5.0	2	1.1	5	2.8	1	0.6	1	0.6	2	1.1	1	0.6	1	0.6
Preferred delivery style of Training	181	100	110	60.8	71	39.2	27	14.9	31	17.1	14	7.7	30	16.6	57	31.5	22	12.2
Interactive workshop	94	51.9	61	33.7	33	18.2	13	7.2	16	8.8	8	4.4	16	8.8	29	16.0	12	6.6
Lecture/Talk	45	24.9	25	13.8	20	11.0	8	4.4	10	5.5	2	1.1	7	3.9	14	7.7	4	2.2
Practical activities	17	9.4	9	5.0	8	4.4	2	1.1	1	0.6	1	0.6	3	1.7	8	4.4	2	1.1
Online	17	9.4	8	4.4	9	5.0	2	1.1	4	2.2	1	0.6	2	1.1	5	2.8	3	1.7
Journal club/Discussion	2	1.1	1	0.6	1	0.6	0	0.0	1	0.6	0	0.0	0	0.0	1	0.6	0	0.0
Other[d]	6	3.3	4	2.2	2	1.1	3	1.7	0	0.0	0	0.0	1	0.6	1	0.6	1	0.6

[a]As short as possible, 1 h, depends on the course, e-learning/online, minimum necessary time.

[b]No preference, any time, during working hours/day, not on weekends, and online/e-learning.

[c]Anywhere in the city, depends on the course/topic, happy to travel further; not outside of the city, online/distance learning with face-to-face only when essential, anywhere with suitable parking, location does not really matter, no preference.

[d]Depends on the course/topic, face-to-face, master classes, mixture of styles, depends on the topic.

TABLE 4 Barriers to attending training

| Barriers | Total | | Gender | | | | Professional role | | | | | | | | | | |
| | | | Female | | Male | | Administrators/managers | | Medical doctors/dentists | | Allied health professionals | | Research nurses/midwives | | Research scientists | | Others | |
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Total respondents	129	100	84	65.1	45	34.9	21	16.3	23	17.8	9	7	23	17.9	35	27.1	18	14
None	48	37.2	27	20.9	21	16.3	7	5.4	3	2.3	2	1.6	5	3.9	23	17.8	8	6.2
Yes[a]	81	62.8	57	44.2	24	18.6	14	10.9	20	15.5	7	5.4	18	14.0	12	9.3	10	7.8
Lack of time	25	30.9	17	21.0	8	9.9	6	7.4	5	6.2	2	2.5	3	3.7	7	8.6	2	2.5
Work commitments	17	21.0	14	17.3	3	3.7	4	4.9	2	2.5	2	2.5	5	6.2	0	0.0	4	4.9
Clinical commitments	15	18.5	9	11.1	6	7.4	0	0.0	9	11.1	0	0.0	5	6.2	1	1.2	0	0.0
Childcare and family commitments	11	13.6	7	8.6	4	4.9	3	3.7	2	2.5	0	0.0	2	2.5	3	3.7	1	1.2
Traveling and parking	6	7.4	5	6.2	1	1.2	0	0.0	2	2.5	1	1.2	0	0.0	1	1.2	2	2.5
Insufficient notice	5	6.2	2	2.5	3	3.7	0	0.0	1	1.2	2	2.5	0	0.0	1	1.2	1	1.2
Part-time work	5	6.2	5	6.2		0.0	0	0.0	0	0.0	2	2.5	2	2.5	1	1.2	0	0.0
Relevance/right course	4	4.9	3	3.7	1	1.2	0	0.0	1	1.2	0	0.0	0	0.0	1	1.2	2	2.5
Cost/fees	4	4.9	4	4.9	0	0.0	1	1.2	0	0.0	1	1.2	1	1.2	1	1.2	0	0.0
Location/city centre	4	4.9	3	3.7	1	1.2	1	1.2	0	0.0	1	1.2	1	1.2	1	1.2	0	0.0
Permission	2	2.5	2	2.5	0	0.0	1	1.2	1	1.2	0	0.0	0	0.0	0	0.0	0	0.0
Other (e.g., talks and students)	1	1.2	1	1.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.2	0	0.0

aRespondents reported more than one barrier so total count of barriers is greater than the total count of respondents and total percentage is >100%.

major barrier for many administrators and managers, and research scientists; however, medical doctors, dentists, research nurses, and midwives reported clinical commitments as the most common barrier to attending training courses (Table 4).

DISCUSSION

Nearly 800 people were sent the online survey and about one in four participants completed and returned it. Thus, the response rate was 24%, which is relatively low but it is comparable to many studies involving clinicians and using online/web surveys,[18] which usually have a low response rate.[19] Nonetheless, the accuracy and validity of studies with lower response rates are not less than the studies having higher response rates.[20,21]

Six of ten (60%) respondents were women and the largest professional group to respond was research scientists (31%). The proportion of female respondents tends to be higher than male respondents in studies that have important implications for women such as gender equity and markers of achievement in translational research settings,[22] as well as health and wellbeing issues affecting clinicians and other healthcare professionals.[23]

While the majority of respondents reported receiving training within the past year, there were mixed reviews regarding the usefulness of the training. Those courses linked directly to professional development, career advancement, and research expertise were well received given their implications for developing competencies and improving recruitment and retention, as well as improving healthcare delivery[3] and research productivity such as publications.[10]

For example, training in leadership skills and research grant and fellowship writing were highlighted as the most important training opportunities for the future as these skills are associated with advancement in rank and leadership positions as well as research excellence.[10] Training in leadership also helps in increasing personal effectiveness and promoting a positive attitude to professional development.[9] Female respondents were more likely to identify the need for leadership skills training when compared to male respondents. These findings may be indicative of a gap in leadership skills among women in translational research settings[24,25] where leadership is considered as a marker of achievement.[22] Gender equity in leadership is essential,[22,25] and the gender gap in leadership could be reduced by providing leadership training.[26] Training in gender-specific leadership interventions can also improve leadership and decision making.[27]

In terms of training delivery method, our results showed that mornings were the most popular, along with half-day interactive workshops, which promote deeper and more productive learning.[28]

The most preferred training location was near to the workplace, which is recommended for the training of healthcare workers.[29] We found that busy professionals working in translational research, such as clinicians and nurses, need training that is convenient, nearby, and flexible to fit with their incredibly busy schedules.[30]

A range of barriers to attending training were reported and the major barriers were the lack of time,[31] work and clinical commitments as well as childcare and family responsibilities.[32] The greatest barriers to attending training among medical doctors, dentists, nurses, and midwives were lack of time and clinical commitments.[33] In contrast, administrators, managers, and research scientists had less time to attend training. Transportation and parking were also obstacles to training, especially for people with disabilities. It is therefore imperative to provide training at a convenient and easily accessible location where participants do not have to travel, which could save the time of busy clinicians and it would be a great advantage to participants with disabilities and other limitations.

Table 5 shows differences by gender and role of respondents regarding training experiences, needs, and barriers, which we present at two levels, namely first and second most frequently occurring based on the most and second most common number of responses, respectively. We found some differences based on the gender and roles of respondents, but these were not statistically significant and therefore we do not present the results of these statistical analyses here. The differences in training issues not being statistically significant could be attributed to the fact that there were many categories of each training issue and fewer responses in some categories.

Nonetheless, our findings showed that female participants could not afford to attend a training course for an entire day because of family commitments such as childcare and caring for elderly and sick family members, that are mostly carried out by women,[34] both before and during the COVID-19 pandemic.[35]

Our results revealed that the most common barrier to attending training for medical doctors, dentists, and research nurses was clinical commitments, while for research scientists, administrators, and managers the most common barrier was time constraints (Table 5), however these differences were not statistically significant.

However, evidence shows that the role or professional group of a trainee is an important factor that influences training needs.[31] It is therefore important that professional training is inclusive and considers participants' professional roles, preferences, needs, accessibility, location, timing, physical limitations, and work and family commitments. It is also essential to consider equality, diversity,

TABLE 5 Differences in training needs, preferences, and barriers by gender and role

Parameter	Gender		Professional Role	
	Female	**Male**	**Administrators/ managers**	**Medical doctors/dentists**
Training received in the last year				
Most common[a]	Research methods; statutory and mandatory training	Statistics and data analysis	Statutory and mandatory training	Statistics and data analysis; good clinical practice
Second most common[b]	Statistics and data analysis	Good clinical practice; leadership skills	Statistics and data analysis; research methods	Research methods
Training found most valuable				
Most common[a]	Statistics and data analysis; research methods	Leadership skills; statistics and data analysis	Statistics and data analysis	Research methods
Second most common[b]	Statutory and mandatory training	research methods	Research methods	Statistics and data analysis; ethics and consent; good clinical practice
Most important training area				
Most common[a]	Leadership skills	Leadership skills	Leadership skills	Statistical analysis
Second most common[b]	Statistical analysis	Research grant/Fellowship writing	Research skills	Leadership skills
Ideal length of training				
Most common[a]	Half a day	Half a day	1–2 h	Half a day
Second most common[b]	1–2 h	Whole day	Half a day	Whole day
Preferred time of the day for training				
Most common[a]	Morning	Morning	Morning	Morning
Second most common[b]	Afternoon	Afternoon	Other	Afternoon
Ideal location for training				
Most common[a]	John Radcliffe Hospital	John Radcliffe Hospital	John Radcliffe Hospital	John Radcliffe Hospital
Second most common[b]	Churchill Hospital/Old Road Campus	Churchill Hospital/Old Road Campus	Oxford City Centre	Churchill Hospital/Old Road Campus
Preferred style of training delivery				
Most common[a]	Interactive workshop	Interactive workshop	Interactive workshop	Interactive workshop
Second most common[b]	Lecture/Talk	Lecture/Talk	Lecture/Talk	Lecture/Talk
Barriers to attending training				
Most common[a]	Lack of time	Lack of time	Lack of time	Clinical commitments
Second most common[b]	Work commitments	Clinical commitments	Work commitments	Lack of time

[a]Highest number of responses.

[b]Second highest number of responses.

Allied health professionals	Research nurses/midwives	Research scientists	Others
Statistics and data analysis	Good clinical practice; statutory and mandatory training	Statistics and data analysis	Statistics and data analysis
Research methods; leadership skills	Research methods; degrees, diplomas, and certificate courses	Research methods; leadership skills	Research methods; statutory and mandatory training; good clinical practice; degrees, diplomas, and certificate courses; ethics and consent
Statistics and data analysis	Degrees, diplomas, and certificate courses; statutory and mandatory training	Statistics and data analysis	Statistics and data analysis
Leadership skills; ethics and consent; clinical skills; research methods	research methods; clinical skills	Leadership skills	Ethics and consent
Research grant/fellowship writing	Designing and conducting clinical trials; clinical skills	Research grant/fellowship writing	Leadership skills; academic writing
Leadership skills; Statistical analysis	Leadership skills; statistical analysis	Leadership skills	Research grant/fellowship writing; statistical analysis; clinical skills; research skills
Half a day	Half a day	Half a day	Half a day
Whole day	Whole day	1–2 h; whole day	1–2 h
Morning	Morning	Morning	Morning
Afternoon	Afternoon	Afternoon	Afternoon
John Radcliffe Hospital	Churchill Hospital/Old Road Campus	John Radcliffe Hospital	John Radcliffe Hospital
Churchill Hospital/Old Road Campus	John Radcliffe Hospital	Churchill Hospital/Old Road Campus	Churchill Hospital/Old Road Campus
Interactive workshop	Interactive workshop	Interactive workshop	Interactive workshop
Lecture/Talk	Lecture/Talk	Lecture/Talk	Lecture/Talk
Lack of time; insufficient notice; work commitments; part-time work	Clinical commitments; work commitments	Lack of time	Work commitments
Traveling and parking; cost/ fees; location (e.g., city centre)	Lack of time	Childcare and family commitments	Lack of time; traveling and parking; relevance/right course

and inclusion in the development of training programs, especially in biomedical research settings where translational research is conducted in diverse clinical domains by multidisciplinary research teams,[36,37] which often have differing training needs and preferences as identified in the present study.

Training gap

In our survey we asked participants what type of training they had already received in the previous year and what they found valuable, and we discovered that nearly one-third of the respondents (32%) did not receive any training at all. For those who had received training (68%), networking with other researchers was one of the main benefits. Even though professional training courses such as good clinical practice and informed consent remain mandatory, there is a gap in continuous personal development training.

Interestingly, 57% of the 44 respondents who identified leadership as their most important development and training need were women and 27% were clinical staff. Studies have shown the importance of good medical leadership training[38] because leadership is one of the competencies required in translational research.[36]

The results of our study indicate a gap in the availability of training opportunities, particularly for leadership training, for translational researchers. These findings can be used to further develop training as an integral part of career development pathways for translational researchers and research support staff in order to meet their professional and career advancement goals.

Strengths and limitations of the study

We conducted this survey to identify gaps in the NIHR Oxford BRC's training and development program as well as to identify the training and development needs and preferences of translational researchers and research support staff affiliated with or supported by the BRC. Leadership, grants/fellowship writing, and statistical analysis skills were the most sought-after training skills. Time constraints and work commitments, along with childcare obligations, impeded attendance at training programs.

Limitations of the study include a relatively low response rate (i.e., 24%); however, this is comparable to previous studies[18] and is even higher than some earlier research involving clinicians.[39] Another limitation of the study is that there were no statistically significant differences in

training needs, preferences, and barriers based on either the gender or professional role of the respondents.

CONCLUSIONS

In translational research settings, training sessions should be held at a convenient location, during the working day, preferably in the morning, to best meet the training needs of translational researchers and research support staff. Training should be easily accessible, interactive, and relevant. Among the most critical areas for training of translational researchers are leadership skills, grant and fellowship writing, and statistics and data analysis. Time constraints as well as clinical and work commitments continue to be the biggest barriers to training for translational researchers, especially for clinicians and nurses. Translational researchers have different training needs, preferences, and barriers dependent on the participants' sociodemographic characteristics, mainly their roles and professional groups, which need to be taken into account when designing inclusive training and developing courses and programs in biomedical research settings.

CONFLICT OF INTEREST
K.B. is Training and Education Manager, S.G.S.S. is Senior Research Fellow, L.R.H. is Senior Manager, and V.K. is Chief Operating Officer at the National Institute for Health Research Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust, John Radcliffe Hospital, Oxford, United Kingdom.

AUTHOR CONTRIBUTIONS
K.B., S.G.S.S., L.R.H., and V.K. wrote the manuscript. K.B. and S.G.S.S. designed the research. K.B. performed the research. K.B. and S.G.S.S. analyzed the data.

CONSENT TO PARTICIPATE
In line with the University of Oxford's policy on staff and students in research, participation was entirely voluntary. Participants were able to withdraw at any time, and their participation or decision not to participate did not affect their employment or academic assessment in any way. Completion of the questionnaire survey was considered as their consent. All data were coded to ensure participants' anonymity and confidentiality, and data were digitally stored on a password-protected PC that could only be

accessed by the lead researcher. Results are reported at an aggregate level.

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ORCID

Karen Bell https://orcid.org/0000-0003-1163-9283
Syed Ghulam Sarwar Shah https://orcid.org/0000-0002-5713-3686
Lorna R. Henderson https://orcid.org/0000-0001-8778-1740
Vasiliki Kiparoglou https://orcid.org/0000-0001-9886-7902

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