Delphi Panel Briefing Document

Survey Round 2

Essential Research Skills Training Curriculum

Synthesising the Evidence

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Introduction

Here we present the report following the second round of the *Process for developing an evidence-led Essential Research Skills Training Curriculum Delphi*. This study developed as a collaboration between the World Health Organization's Special Programme for Research and Training in Tropical Diseases (WHO-TDR) and The Global Health Network (TGHN). The aim of this study is to find consensus on what constitutes the minimum set of skills, knowledge and key principles that would enable those without previous experience in research to undertake high-quality health research.

Delphi panel

The panel for this Delphi study is formed of both experts and stakeholders in health research and health research training, with heterogeneous expertise and from diverse geographical regions. We received 594 expressions of interest and, in addition, we invited 63 research experts. We then invited 414 to participate, and we received a positive response from 254 (61%) who proceeded to complete Delphi round 1. We aim to include the broad views of research experts and research stakeholders including: research participants, research training facilitators, members of research advisory committees, research funders, authors of peer-reviewed research training papers, authors of research training books/programmes, journal editors, research policy makers and regulators and early career researchers.

Delphi - Knowledge gap analysis

As a foundational step to inform the Delphi, we conducted a comprehensive review of responses from a range of defined sources including research training needs surveys, session evaluations from research training workshops and feedback submitted on completion of eLearning, collected by The Global Health Network from 2017 to 2019. We analysed the responses of 7,167 participants from 153 countries across the globe. This provided us with 98 research skills topics and themes that formed the categories presented in the Delphi round 1 Survey.

Delphi Round 1

Delphi Round 1 offered an opportunity for panellists to indicate which of the listed 98 themes they consider essential and should be included in the Essential Research Skills Training Curriculum.

Themes were scored on two dimensions: [a] relevance (should this category / skill be included?) and [b] clarity of each statement (is it clear what the category or theme reflects). Relevance was scored on a 7-point Likert scale.

Agreement to <u>include</u> themes in the *Essential Research Skills Training Curriculum* was defined as more or equal to 85% of responses indicating *Mostly Agree* and *Completely Agree*.

Agreement to <u>exclude</u> themes in the Essential Research Skills Training Curriculum was defined as more or equal to 85% of responses indicating *Mostly Disagree* and *Completely Disagree*.

Acceptable statement clarity was set to \ge 80%. Any statement's for which clarity scored below 80% was re-defined and re-evaluated in Round 2.

Round 1 Delphi results:

- The panellists reached consensus on 43 themes to be <u>included</u> in the Essential Research Skills Training Curriculum.
- No consensus was reached for any theme to be excluded from the Essential Research Skills Training Curriculum.





• Scoring across the relevance classification determined that the remaining 55 themes were to be re-evaluated in Round 2, alongside 8 themes indicated as unclear in Round 1 and a further 10 *new* themes generated by panellists in Round 1.

Delphi Round 2

Delphi Round 2 re-evaluated the remaining 55 themes alongside 8 themes indicated as unclear in the first round and 10 new themes generated by panellists in Round 1.

For the purposes of Round 2, themes were scored on a yes/no nominal scale for both relevance and clarity.

Next steps – Validation workshop

The concluding stage in this process seeks to ratify and validate the proposed *Essential Research Skills Training Curriculum* through a WHO-TDR-led workshop. More details to follow shortly.

Panellists

Characteristics of panellists

The following analysis will include the data from the pilot participants that completed both Round 1 and Round 2. Pilot participants n=5.

A total of 254 panellists, including experts and stakeholders, completed the Delphi Round 1. Round 2 of the Delphi was completed by 222 panellists, giving a panellist retention rate of 87%.

	De	lphi Survey (N=254	Round 1 4)	Delp	Round 2	
Gender	Male	Female	No information	Male	Female	No information
	105	137	12	93	118	11
Age	50 (ra	nge 24-72)	10	52 (range 24-72)		10
Years of research practice: self- reported (average)	of research ice: self- 10 years ted (average)		10	11 years		10

Table 1: Characteristics of panellists (self-reported)





Geographical Distribution of panellists

Geographical distribution of panellists according to World Health Organisation (WHO) regions.

WHO Regions	Round 1 (n= 254)	Round 2 (n=222)
African region	81 (32%)	67 (30%)
Americas	51 (20%)	44 (20%)
Eastern Mediterranean	13 (5%)	13 (6%)
European	63 (25%)	57 (26%)
South East Asia	27 (11%)	25 (11%)
Western Pacific	19 (7%)	16 (7%)

Table 2: Geographical distribution of panellist by WHO regions

Panellists' country of work classified by World Bank Income Groups

Country classification by income	Round 1 (n= 254)	Round 2 (n=222)
High Income	83 (32%)	75 (33%)
Upper middle income	50 (20%)	44 (20%)
Lower middle income	93 (37%)	83 (38%)
Low income	28 (11%)	20 (9%)

World Bank Income Groups published in June 2020.

Table 3: Panellists' country of work classified by World Bank list of economies (June 2019)

Panellists research experience

Our panellist group included experts in research and research training, and stakeholders such as researchers with experience working for research funding organisations, editorial boards of health research journals, research advisory committee/international review board members, policymakers, research commercial industry, research regulators and research participants.

This data was available from all panellists with the exception of 10 in Round 1, and 9 in Round 2.

Research experience	Round Information avail (n= 244)	1 able from)	Round Information ava (n= 21	d 2 ailable from 3)	
I have experience leading research projects	146	60%	129	60%	
I am currently working in research	170	70%	162	75%	
I am/have been the named lead on grant applications	60	24%	56	26%	
I deliver training in health research (e.g. GCP)	94	38%	84	39%	
I mentor undergraduate/postgraduate/PhD students engaged in research	107	43%	106	49%	
I am involved in the design or coordination of training curriculums	68	27%	60	28%	





that include research skills (e.g. undergraduate courses/medical courses)				
I am a member of a research advisory committee/international review board	35	14%	35	16%
I work for a research funding organisation (e.g. Wellcome, EDCTP)	14	6%	10	4%
I have authored and published peer- reviewed research training papers	41	16%	41	19%
I have authored and published research-training themed books or manuals	14	6%	13	6%
I am an editor or on the editorial board of a health research journal	28	11%	27	13%
I am a policymaker or hold a position within the Ministry of Health	10	4%	9	4%
I work for/have experience working for a regulator (e.g. FDA)	8	3%	7	3%
I work for/have experience working within commercial industry (e.g. GlaxoSmithKline)	25	10%	23	11%
Research participant	105	42%	92	43%
None of the above	2	1%	4	2%
Other	13	5%	13	6%

Table 4: Panellists' research experience (* multiple options could be selected)

Panellists' research health area experience - The options for this list were adapted from the WHO priorities for research for Health.

Health area	Round 1 Information available from (n= 244)		Roun Information av (n= 21	d 2 ailable from .3)	
Influenza (Flu) Viruses	20	8%	17	7%	
Ebola	10	4%	9	4%	
Zika	13	5%	9	4%	
Malaria	36	14%	30	14%	
Dengue	23	9%	16	7%	
HIV	55	22%	52	24%	
Other high-threat pathogens (i.e Rift Valley fever)	2	0%	2	0%	
Other human infection studies	49	20%	43	20%	
Vector studies	11	4%	11	5%	
Neglected Tropical diseases	cal 26		26	12%	
Non-communicable diseases	69	28%	67	31%	
Reproductive, Maternal, Neonatal Child or	65	26%	58	27%	





Adolescents Health research				
Primary health care	60	24%	60	28%
Vaccines	37	15%	31	14%
The health impacts of	6	2%	6	2%
climate and				
environmental change				
Health promotion	46	19%	47	21%
Methodology Research	64	26%10%	54	25%
(research on research)				
Health policy and	26	10%	36	16%
Systems Research				
Health Economic	15	6%	12	6%
Analysis				
Health Decision Sciences	15	6%	11	5%
Not applicable (i.e. for	10	4%	9	4%
research participants)				

Table 5: Panellists' research health area experience (* multiple options could be selected)

Research methodology	esearch Round 1 ethodology Information available from (n= 244)			d 2 ailable from .3)
Clinical trials	139	57%	122	57%
Epidemiological studies	97	39%	93	44%
Case studies	81	33%	75	36%
Observational studies	146	59%	139	66%
Other Quantitative	43	17%	39	18%
methodology studies				
Qualitative methodology	90	36%	76	36%
studies				
Mixed methods research	76	31%	74	34%
Evaluation studies	54	22%	47	22%
Consensus-method studies	15	6%	15	7%
Action research	22	9%	22	10%
Document research	35	14%	35	16%
Not applicable (ie for	6	2%	6	3%
research participants)				
Other	9	3%	9	4%

Table 6: Panellists' research topic experience (* multiple types of studies could be selected)





Delphi Round 2 results

The following section provides a more detailed impression on an item-by-item basis. Furthermore, we include all the feedback commentary for each item from the panel.

Themes re-evaluated in Delphi Round 2 (n=222)

The panellists reached consensus in Delphi Round 1 for 43 listed themes. These themes were ranked as *strongly recommended* for inclusion in the Essential Research Skills Training Curriculum. No consensus was reached to exclude any theme from the Essential Research Skills Training Curriculum. The remaining 55 themes have been re-evaluated in Delphi Round 2 alongside those that were identified as unclear, and new themes suggested by panellists in Round 1.

Percentages were calculated in relation to the responses obtained and excluding "no response".

Table key

Clarity -	Themes score as
Green font	"clear" ≥ 80%

		Relevance						Clarity				
Round 2		Essential training		Not essential training		No response	Clear		unclear		No Response	
		n	%	n	%	No response	n	%	n	%	Blank	
1	Understanding the difference between research for health and standard of care, audit, evaluation	186	86%	31	14%	5	174	87%	25	13%	23	
2	Mixed Methods research	164	76%	52	24%	6	167	84%	32	16%	23	
3	Meta-analysis	146	67%	71	33%	5	177	92%	15	8%	30	
4	Health Policy and Systems Research	156	73%	59	27%	7	178	92%	15	8%	29	





5	Health economics and economic evaluations	114	54%	99	46%	9	178	91%	17	9%	27
6	Research designs for outbreaks	164	75%	54	25%	4	178	90%	19	10%	25
7	Methodology Research (research on research)	161	74%	58	26%	3	171	88%	24	12%	27
8	Implementation Research	178	82%	38	18%	6	175	89%	21	11%	26
9	Experimental research	186	85%	32	15%	4	178	91%	18	9%	26
10	Identifying various funding agencies/sources	147	68%	70	32%	5	190	95%	9	5%	23
11	Ability to communicate and meet with funders	140	65%	76	35%	6	186	94%	12	6%	24
12	Writing a grant application and/or grant proposal	169	87%	26	13%	27	193	97%	5	3%	24
13	Setting up a research laboratory	119	55%	99	45%	4	178	89%	21	11%	23
14	Specific laboratory techniques and equipment handling	132	60%	87	40%	3	188	94%	12	6%	22
15	Laboratory sample handling and storage	144	66%	75	34%	3	187	94%	11	6%	24
16	Laboratory management	114	53%	103	47%	5	172	87%	26	13%	24
17	Laboratory standards and regulations	144	66%	74	34%	4	181	92%	15	8%	26
18	Laboratory quality best practices	153	70%	67	30%	2	178	92%	15	8%	29
19	Laboratory safety practices	156	71%	64	29%	2	181	95%	10	5%	31
20	Good Clinical Laboratory Practice (GCLP)	173	79%	46	21%	3	183	95%	10	5%	29
21	Laboratory biosafety and how to manage hazards	156	71%	63	29%	3	180	94%	12	6%	30
22	Participant retention strategies	173	79%	45	21%	4	169	87%	26	13%	27
23	Participant 'loss to follow-up'	172	80%	44	20%	6	167	86%	28	14%	27
24	Attrition bias and prevention methods	170	79%	46	21%	6	164	84%	31	16%	27





25	Statistics	197	90%	22	10%	3	184	94%	12	6%	26
26	Data analysis software (qualitative and quantitative)	188	86%	31	14%	3	184	96%	8	4%	30
27	Quality assurance systems	140	65%	77	35%	5	171	86%	27	14%	24
28	Quality management systems	131	60%	86	40%	5	173	88%	24	12%	25
29	Audit	127	59%	90	41%	5	172	88%	24	12%	26
30	Development of Standard Operating Procedures (SOPs)	174	81%	40	19%	8	193	97%	6	3%	23
31	Research Time management	171	79%	45	21%	6	185	93%	13	7%	24
32	Study set-up	199	92%	17	8%	6	190	95%	10	5%	22
33	Storage of research materials	174	81%	42	19%	6	191	96%	8	4%	23
34	Writing a study budget	185	85%	32	15%	5	191	98%	4	2%	27
35	Budget management	173	79%	45	21%	4	192	97%	5	3%	25
36	Pharmacovigilance principles and reporting adverse effects	179	82%	40	18%	3	187	96%	8	4%	27
37	Setting up an ethical review board or committee	131	60%	87	40%	4	187	95%	10	5%	25
38	How to search for secondary datasets in different databases	151	70%	66	30%	5	178	89%	21	11%	23
39	Use of citation tools (i.e. Mendeley)	175	81%	42	19%	5	185	94%	11	6%	26
40	How to translate research results into practice within healthcare settings	185	85%	33	15%	4	194	98%	4	2%	24
41	Leadership in research	147	67%	71	33%	4	177	90%	19	10%	26
42	Leading and managing complex research groups	123	57%	94	43%	5	181	91%	17	9%	24
43	Influencing at institutional level to enable research	123	58%	90	42%	9	176	88%	25	12%	21





44	Handling and negotiating with a range of stakeholders	135	63%	79	37%	8	184	92%	17	8%	21
45	Building trust within a team	176	81%	40	19%	6	190	95%	10	5%	22
46	Networking and how to create collaborations	172	80%	43	20%	7	189	96%	8	4%	25
47	Building your career in research	168	78%	48	22%	6	183	92%	16	8%	23

Redefined themes from Round 1 Delphi (n=222)

These themes were indicated by panellists as "unclear" in Delphi Round 1. The criterion for themes to be considered "unclear" was a score of <80% on the clarity classification.

		Relevance					Clarity				
		Essential t	raining	Not ess trair	sential ning	No response	Cle	ar	unc	lear	No Response
		n	%	n	%	No response	n	%	n	%	Blank
48	How to form a research agenda - NEW: Identifying a list of research areas to focus on and the order of priority in which they should be addressed	175	81%	41	19%	6	184	92%	15	8%	23
49	Social sciences and anthropological studies - NEW: The role and contribution of qualitative social science approaches and social science research to understanding the context, influences and problems concerning health.	148	69%	67	31%	7	177	89%	23	12%	22





50	Mathematical Modelling - NFW: Computerized										
50	mathematical models used as research tools to	108	50%	107	50%	7	178	89%	22	11%	22
	simulate medical outcomes		00/0					0070		/*	
51	Operations research - NEW: A discipline that uses advanced analytical methods (e.g. simulation, optimisation, decision analysis) to better understand complex systems and aid in decision- making	110	52%	103	48%	9	172	86%	28	14%	22
52	Good Participatory Practice (GPP) - NEW: Guidelines for how to effectively engage with stakeholders throughout the research lifecycle of health research.	175	80%	43	20%	4	187	95%	10	5%	25
53	Community engagement principles and activities, from the beginning of the research cycle through to feeding back research results to communities - NEW: Community engagement principles and approaches used throughout the research lifecycle to identify partners, consult in protocol development, draft consent process, conduct research and disseminate results.	179	84%	35	16%	8	183	91%	18	9%	21
54	How to manage expectations of study communities - NEW: Consider the expectations of all of those involved in the research process; the overall aim of the research and what it hopes to achieve, and therefore who seeks to gain (and what) from participating in such a research study.	166	76%	51	24%	5	178	91%	18	9%	26





55	Governance and regulation - NEW: Governance is	180	83%	37	17%	5	183	93%	14	7%	25
	the system of administration, regulations and										
	supervision through which research is managed,										
	participants and staff are protected, and										
	accountability is assured.										

New themes identified from panellist comments in Delphi Round 1 (n=222)

			Relevance					Clarity				
		Essential t	raining	Not es traii	sential ning	No response	Cle	ear	uno	clear	No Response	
		n	%	n	%	No response	n	%	n	%	Blank	
56	Contingency plans for research studies (in situations like pandemics, etc)	165	75%	54	25%	3	183	94%	11	6%	28	
57	How to set up study training	162	75%	53	25%	7	174	89%	21	11%	27	
58	Critical appraisal of a research paper	186	85%	32	15%	4	184	94%	11	6%	27	
59	Authorship in research	175	80%	43	20%	4	185	94%	11	6%	26	
60	Research registries (Database that allows researchers to provide specific details about their project to serve as a record for the scientific community)	160	74%	55	26%	7	164	84%	32	16%	26	
61	Medicines Supply and Regulations	116	54%	100	46%	6	167	85%	30	15%	25	





62	Research Indexing (Indexing is the process of creating indexes for record collections. Indexing journals/research allows for discoverability)	121	56%	95	44%	6	141	73%	53	27%	28
63	Legal issues in research	183	84%	34	16%	5	181	92%	15	8%	26
64	Intellectual property rights	163	74%	56	26%	3	177	91%	17	9%	28
65	Principles of Big data analysis	154	70%	65	30%	3	170	87%	25	13%	27

Round 2: Panellists comments

"Please use the comments box available below to comment on any aspect including items missed, the wording of the new items or to challenge anything that seems to misrepresent Essential Research Training Skills knowledge."

There should be mention of an evaluation system to gauge research competence - new and old.

I suggest that use of software & statistical applets need to be emphasized especially for estimation of sample size and sampling techniques. Use of proposal, thesis, scientific writing guidelines. Scientific writing skills are necessary

Overall, I am satisfied with the items as appropriate. Although some items are more suitable then others, that is usually expected in every situation.

In essential research skills, is critical to involve individual participants at the planning of research and training process as part of community engagement process. This aspect has been neglected in the part but the most essential parts of research. Once this is done, having access to community members to be engaged in research will be eased at any time.

The report from the first round seemed to show that many participants did not focus on identifying the most relevant skills for NEW investigators. There also seems to be some lack of clarity about whether the training would be for population-based research, laboratory-based research, or other types of investigations. If many types of research areas are included in the curriculum (mathematical modelling, econometrics, anthropological approaches, epidemiology, clinical trials, and so on), each can be covered only very superficially. If a narrower definition of health research is provided, the participants in the Delphi process will be better able to comment on which skills are essential, which are supportive but not critical for new investigators, and which are not important to include in a basic curriculum.

preparation and content of research protocol and dissemination strategies

The intent of this survey is to cultivate the interest of persons without prior experience in health research. Many of the themes should have been tailored to direct their zeal into health systems research. I think this aspect and similar features were missing. It should be considered in the next round.

It would be good to raise question on qualitative and quantitative research because there is wrangling among researchers on the use of qualitative or quantitative research as both methods have their flaws, However, many researchers concluded that quantitative research is much better than qualitative research because it deals with a larger population which can produce a more reliable result than qualitative research.

research in limited resource settings

Several of the items would be useful, but not essential for ANYONE undertaking research. It is important that the outcomes of the study do not result in an overly large and cumbersome set of modules which are not relevant to everyone. Extra content areas can be included as electives





In my answers I considered the curriculum essential for the training of a new researcher, someone who comes from an undergraduate course and wants to start research. All the topics presented are of interest to a researcher, but I assume that the junior researcher will always be under the supervision of someone more experienced and that the training will be continuous. I believe that the question "Setting up an ethical review board or committee" could be replaced by understanding the role of, and how, a review board or committee works.

Translational data used in research

The statements in Some new items are lengthy and convoluted. They could benefit from revision

On medicines supply and regulations: individual countries have different regulations and for this one to be included, it needs to be tabled to see how regulations are in different countries

I am not sure if "Clinical Data Management Practices" was listed as one of the options because I don't recall seeing it. This is a very important topic to include as part of an Essential Research Training Program. The quality of data collected and analysed is of paramount importance to any health research. Also "Fraud and Misconduct" should be included as part of the curriculum because it is very important in understanding the codes of research ethics.

Many of the essentials that were mentioned seem to have some significance in new researchers trying to conduct their own research. I think basic knowledge of finance shouldn't be a priority unless absolutely required. Being able to form research ideas should be more of a priority in basic levels of studies. A special understanding of what might go wrong in research should also be included. Like not getting a positive result to the one you were hoping to get. Also, a chapter on how to apply to a paper should also be added.

Some of the topics need to be covered in depth, while others could be touched on briefly to ensure awareness. Perhaps this could be a further refinement as part of this Delphi project. For example, a researcher needs to understand how to write a research protocol in an in-depth way. However, things like "big data analysis" and meta-analysis should be understood from an awareness but not in depth. Similarly, I don't think one would need to know how to set up an ethics committee but should understand the role of ethics committees and researchers' responsibilities wrt ECs.

Communicating with editors and reviewers writing progress reports

The skills training should be grouped as to broad categories. e.g. laboratory vs clinical vs public health e.g. Laboratory topics such as lab management, will not be relevant to non-lab research

Implementing the same research in areas of different socioeconomic demographics i.e. contextualizing research. Myths and misconceptions surrounding research History of medical research

Privacy also requires essential research training however, as researchers we also need good clinical practice for safety of research participants.





The health workers who need the research ethics criteria and engaged in conducting research need to be registered and approved in a systematic way as health research officers to avoid engagement of other non health workers conducting health researches. This is one of the big challenge in the outcome of data especially in qualitative research.

It is not clear how a research topic is to be selected for achieving academic prerequisites and evaluation of already ongoing project and its monitoring at every step, so that it can achieve its stated goals.]

 Dissemination of study findings apart from publication ethics, could elaborate on avoiding publishing in non predatory journals/ availability of a check list or guide to identify predatory publishers or journals in the organization/work place.
Section 10 sub point 2 - How to Set up study training :- Could not understand the term, if I understood the concept right, it can be reframed/elaborated for simpler understanding into "Organization/institutes to have periodical research re-orientation training/workshops on research methodology, grant writing and statistical analysis".
Section 8 - sub point 15 on Leadership in research :- context is not understood. Is it with respect to mentorship or role models being available for researcher or to ensure participant is trained to be a leader?
Personally felt Big data analysis, mathematical modelling, health policy, economic evaluation, health technology assessment is not necessary for essential research training skills, could be incorporated into advanced research learning.





This is turning into a huge agenda for training, with many areas covered including qualitative research, stakeholder management etc. But there seems to be more of a focus on laboratory-based medicinal research and a slant towards research that may become commercialised. If this is an agenda to train healthcare staff in how to conduct 'research' then I feel that the focus needs to shift back towards the basics - what types of research are conducted (not all interventions include drugs but may be service improvements, trial of online resources etc) and from there move into more of a standard 'research methods' training. For someone working in social care, for example, the laboratory skills suggested are irrelevant - but all potential new researchers do need to understand how to search for existing literature, how to write a protocol, what methods they will use to gather data, how to manage that data, how to involve a range of different stakeholders, how to find and apply for funding etc. I would suggest that your 'essential skills' training is beginning to look like a basic 'level 1' set of general research skills followed by a level 2 set of skills specific to different situations - those who will work in laboratories may not need to know much about stakeholder management but will need a good understanding of safety procedures whereas those in an allied health field such as dentistry might not need to know about intellectual property but might benefit from a better understanding of how to find funding. Perhaps a future round might begin to separate out 'basic, essential skills' from more advanced and specialised areas - of course, basic training can at least touch on the specialised skills so that a good overall understanding of the research context and landscape, but i think it is as dangerous to assume that all trainees will need all of the skills listed at the same level as it is to assume no one needs any training.

I think we need to have a new section on the use of 'Virtual Reality' and new technology use in research. In addition, should we be thinking about 'commercial/big pharma' co-production PPIE. The roles of NGO's/Charities in co-productive research (particularly the conflict of governance of these types or organisations working methods with commercial/private organisations)? What restrictions might this put on carrying out research?

not very clear about pandemics in basic research

Mentoring Skills Workshop Series for young researchers on formulation of research questions, study design, Methods of data collection, analysis & interpretation of results to build the research capacity among them.

What is missing - systematic searching of literature; critical thinking (it's an essential research skill); evaluation methodologies; ethical research and conduct; qualitative analysis (the software doesnt interpret the data, a researcher has to do that); data quality (co-coding, double-checking entry, access to mentorship when new to research)





Los temas evaluados a través de las diferentes preguntas son importantes, pero se deben seleccionar en función de la intensidad, del tiempo que se tiene para desarrollar la propuesta de formación. Se pudo observar que hay preguntas de temas generales que incluyen a otras mas especificas, las cuales se colocaron como no esenciales.

ESSENTIAL IS A SUBJECTIVE SCALE WITH OBJECTIVE METHODOLOGY. TIME OF ESSENTIAL TRAINING WOULD BE USED TO SCALE INCLUDED ITEMS IN TRAINING PERIOD.

To me everything is in order, I ask in the near future certificate be giving to participants.

protocol registry is important point

The questions are clear and the phrasing of the statements good.

Sometimes it is not clear if it is clear or unclear. Essential and less essential is easier for me to define.

there are some themes that are for sure essential but not for the first step when someone with no experience starts to work in research.

Scale-up practices is necessary training.

This phrase (Influencing at institutional level to enable research) needs to be properly explained to know which specific influence. influence can be either be negative or positive

No very important elements were mentioned as follows: Focus on research plan (research proposal) How to write a research proposal is very important for the researcher And training on the main elements of the research proposal 1- Introduction (background (defining and formulating the problem) . The importance of choosing a topic (justification for the study) Literature and previous studies review: 2- Study objectives: The overall goal: Special goals: Study hypotheses: 3-Methodology: - 1- Type of study: - Variables: ((The result is a dependent variables 2- Place of study: 3- Study community: 4- Study Unit: 5- Sample size: 6- Type and method of sample collection: 7- Data collection tools: 8- Sources and period of data collection: 9- Plan and manage data entry and analysis: 10- Ethical considerations: 11- PreTest Thanks

How to understanding the spiritual beliefs and practices of the study population before approach the research question? (Ex: How to approach a study that includes the analysis of blood samples in a population of Jehovah's Witnesses) ?.

I think that most of the items have been covered in this round. However, you can also include the modern analytical aspects in research/teaching with the help of Machine Learning and AI. Overall, Very Good Study!





I would like to kindly suggest the fact the level of vigilance over academic and sponsored research should be similar. As an example, many malpractice or fraud findings in academic research come from a lack of vigilance from regulatory agencies.

in cases of 'clarity - unclear', it is tough to determine if the training is essential or non-essential, but there were no other options

I appreciate the inclusion of laboratory systems in the second round. But I missed the theme research on laboratory tests themselves just like MEDICINES. Only the use of laboratory for research is addressed if I am not mistaken.

This is a pretty comprehensive list. My only concern is that such lists and recommendations look good on paper and can be implemented with ease in the high-income countries but their implementation in the developing world is incomplete. Thank You for this important initiative. I look forward to contribute to the writing and revision of the manuscript based on this research. kindly keep me updated. Good luck

I would like to insist on data management system.





I found this difficult to understand. At the beginning the Delphi stated, "The aim of this study is to find consensus on what constitutes the minimum set of skills, knowledge and key principles that would enable those without previous experience in research to undertake high-quality health research. The target audience for this curriculum would be any healthcare professional who wants to conduct their own research project and have no previous experience in research." There is an assumption here that "those without previous experience in research" would be able to undertake "high-quality health research." In my experience, this is highly unlikely unless they are supported by an experienced supervisor. In addition, I have stated that most of the skills, knowledge and key principles should be included in a curriculum if a novice researcher wished to undertake these types of research projects. However, I do not believe that novice researchers should be undertaking these projects. For example, I don't think an individual without previous experience in research should undertake a mixed methods approach. This is like taking a driving test in a Formula 1 car. They are better to use a Mini. In my experience with master's students, when they carry out mixed methods, they generally do not achieve high quality research for any of the methods they use because they don't understand how to use them properly. Thus, in my opinion, the Delphi should not only include whether a set of skills, knowledge and key principles are essential to new researchers but also whether they should be encouraged to undertake the research. I would discourage new researchers from undertaking mixed methods, for example, and therefore mixed methods would not be essential for their training. However, if they insisted on undertaking mixed methods, then, obviously, mixed methods would be essential. As a result, the Delphi participants should be able to state whether they feel that individuals lacking research experience should be able to undertake certain approaches or projects. My answers would be completely different if this was the case. For now, though, if novice researchers wish to use the skills, knowledge and key principles outlined in this study, then they would need to learn about them. Thus, all of them are essential. However, I do not believe that novice researchers should use all of them with their level of experience.

encourage scientific writing standards.

Security in laboratory science practicing with biological issues and virus

It appears it might be challenging to achieve consensus of some of the themes due to the disciplinary background and preferences of the respondents.

The new researcher will need to be secure of what are the priorities for research in his/her setting are and be instrumentalized to organize and structure a research.

New researchers need to be properly trained to think on a research based on his/her work and needs to be well instrumentalized to design and conduct the research. The topics I have choose may help to develop these skills.

well there are many things are important such as formulate problem, hypotheses, objectives and samples sizes





I think the wording and the comments of this survey are relevant

Research supervision and how to deal with the supervisors.

legislation of the research in countries

The way I view it is that it would be a rather Herculean expectation to have a consensus on all themes and issues, why? The background of the panellists matters most, as well as their experiences in previous research, the clinician or pathologist could agree with all questions bordering on setting up the laboratory, quality assurance, etc but wouldn't bother so much on mathematical modelling or too much statistics; on the other hand a research manager would be interested in almost every theme, while the data analyst would like themes like mathematical modelling. Hence, the challenge would be a give and take! If study training is done properly and roles and responsibilities are given to qualified personnel, it would obviate much problems- things like medicine, reagents, equipment are better awarded to a qualified procurement specialist. It is good to know the ethics and regulatory processes but no researcher elects his ethics committee nor his Institutional review board this is a job for a higher authority. Community participation is good and representative of community interest groups are always supposed to be part of ethics committee to approve the study! A person who has been involved in a research would always be farsighted than a person that hasn't, it is akin to a judge or the jury, if the selection of the panellists was randomly as was done in Delphi study, then it's difficult to get 100% consensus, but in a paradoxical way they say variety is the spice of life!

I've not seen some basic concepts such as sampling methods, measures of frequency, effects and impact, confounding and how to deal with it specifically mentioned as essential skills.

how conduct a trial during a pandemic, considerations and recommendations. electronic records instead paper records

1.Knowledge of regulatory submissions as well as submitting proposal to Ethics committee / Institutional review board is required. 2.Basic knowledge about drug development especially how clinical experience can be converted into new drug uses needs to encouraged with examples in the essential training which will increase interest of clinical practitioner into research.

Actually, all the materials seem to be important but some things will be learned during years of research.

All materials are interesting but it is impossible to include all

I think that the knowledge of the Government research regulations as well as accountability should be flexible. Because these may vary according to the sociocultural background where the research will be carried out. Let me not say each country for it is too vague, but each Community has always his own rules that differ from another one whereas they are in the same area. This is exactly what I experienced in a recent research in the West Region of Cameroon.





Essential research skills should be made clear, readily available even for the common research subjects.

In my opinion the basic essential skills & more required to execute high quality health research are captured in this study. The new items added to Round 1 unclear ones, broke the themes down to make them more understandable. But a few of the all new items in the last section look vague, so there is need for them to be explained for me to be able to determine their level of essentiality. In all I think this is a worthy effort & tis encompassing.

Medical device aspects are not covered

I feel there is a need to consider nourishing human side of researchers-in-training beyond the technical skills. Giving attention to psychological, social personal aspects of the new researchers would have positive impact on the individual's interest, motivation and success to researching. Enhancing the training curriculum with relevant material and techniques to develop the trainees understanding of their own strength, vulnerabilities as well as others would improve their productivity work satisfaction, work/life balance. Other aspect I have not seen clearly mentioned among the proposed items is about training in scientific writing, teaching and presentations skills, publication, career. development. Apologies if I missed that in the texts. Thank you

Some items can be group into one heading, e.g. contingency plans and how to set up training can be part of the research project management/ operation subject. Principles of big data analysis can be a good aspect to cover as part of the essential curriculum, although should not be too much and can be part of research designs subject. An understanding of public health and epidemiology concepts is also important in designing and conducting health research.





I suspect that how people respond partly reflects their range of research experience? It is my experience, from working with health partners in remote, rural Zambia, that they are generally very switched on to research principles and that comprehensive research training is even more important in such low resource settings, for the protection of all concerned (researchers and participants). Actually, is 'obtaining ethical permission' included anywhere? I may have been more inclusive than many. However, I am aware that healthcare staff in remote, low resource settings often have to be 'jacks of all trades', undertaking the whole research process themselves, from start to finish. They may not have research teams to work with. A thorough grounding in all aspects will help. Thank you, I have enjoyed contributing to this exercise and look forward to hearing the outcomes. Kindest regards, Jo

In principle what I see is good because it helps to analyse all aspects related in clinical trial, I thank you for all the effort that all of you make

Detailed explanation of theme is important, but it becomes unclear if it is too long...

I hereby recommend that every comments and research result are perfect for future reference

I think that the all themes under review as well the new themes should be written in more than one to three words, like it was done with those unclear themes. Some themes were too specific and narrow, such as loss, attrition and retention. I think them should be included in a broader theme, such as Research methodology/Study Designs. I think that a theme on how to search in the scientific indexing libraries should be included as an essential skill.

How to present proposal in front of ethical committee

I think areas like medicines supply and management and laboratory techniques etc. are important aspects of research training but would only apply to a certain subgroup of individuals who may be doing research in such fields. It may be advantageous to create the curriculum with different pathways. There would be one universal curriculum with core components and then specific ones e.g., experimental medicine, epidemiology etc.





it is clear that all items would be important. I tried to focus on those I deep essential for young researchers, in the assumption that they would be part of a research team, with a research leader, who will guide her/him in learning (e.g. with "learning-by-doing" the "non-essential" skills.

While Computerized mathematical models used as research tools to simulate medical outcomes could be very beneficial in certain circumstances, it does not need to be considered an essential skill for the simple reason that each of these simulations have to still be tested anyway before they can be meaningful. Besides, there are many known limits on their use in the physical and biological sciences, Current limits on the present technology include limits given by physical laws, limits given by complexity and also the limits of computation. Finally, mathematical model pertains to observations made in the past, it can therefore be used for policy making. However, it cannot be used for decision making which requires observations or situations in the present.

Modules covering ethical issues in research should be considered as part of essential curriculum

if you really have NO knowledge of clinical trials then even GCP alone are overwhelming. These topics are very broad and include technical topics that even for me are new and I am in trials for over 10 years. Start with the basics and rather have a follow up course when you master the entry level to trials, You are trying to cover all angles in one go - from sites who does not have to have the skill of writing a protocol to maybe a Dr that wants to do his own research and needs to know how to write a protocol - and that is very challenging, Who is the focus group?

Should "essential skills" be only those that a group of people with different interests could benefit from? For example, modelling would be essential for some people while RCTs would be essential for someone else...whereas stats would underlie both study types and people of different groups.

Cultural sensitivity Material and Data transfer





Summary

Essential Research Skills Themes – in order of level of consensus following Round 2

The level of agreement between experts and stakeholders will be translated into levels of recommendations for inclusion in the *Essential Research Skills Curriculum*. The levels will be as follows:

- Level of consensus achieved 100% 75% = Strong recommendation
- Level of consensus achieved 74% 65% = Medium recommendation
- Level of consensus achieved <65% = Weak recommendation

Table key

Level of consensus 100% - 75% Level of consensus 74% - 65% Level of consensus <65% Items added by panellists

Essential Research skills themes	Round 1 Level of consensus	Round 2 Level of consensus
Informed Consent and assent.	98%	98%
Participant's confidentiality and privacy.	98%	98%
Data collection tools (e.g. designing surveys and CRF's).	95%	95%
Ethical practices around data handling/management.	95%	95%
Identifying research participants and selection criteria.	94%	94%
Professional guidelines and codes of ethics which apply to the conduct of clinical research.	94%	94%
Definition of vulnerable populations and ethics of working with these populations.	94%	94%
Qualitative data collection methods.	93%	93%
Quantitative data collection methods.	93%	93%
Critical thinking in research	93%	93%
Selection of control groups for comparison purposes.	92%	92%
Definition of quality data.	92%	92%
Study set-up.	83%	92%
Communicating research	92%	92%
Development of a research question.	91%	91%
Quantitative sampling methods.	91%	91%





Ethical issues related to biological samples	91%	91%
	51/6	51/0
Study reporting procedures and practices	91%	91%
How to translate research results into policy (policy formulation and		
reviews).	91%	91%
Quantitative methodologies.	90%	90%
Statistics.	84%	90%
Qualitative sampling methods.	89%	89%
Definition and methods of randomization.	89%	89%
Security issues during data collection and how to manage risk.	89%	89%
Steps to conduct a literature review.	89%	89%
Concept of health research.	88%	88%
Identifying a research gap.	88%	88%
Writing a research protocol.	88%	88%
Calculation of participant sample size and sample power.	88%	88%
Data management systems.	88%	88%
Data presentation.	88%	88%
Good clinical practice (GCP).	88%	88%
Research Project management and planning.	88%	88%
Epidemiological studies.	87%	87%
Clinical trials.	87%	87%
Writing a grant application and/or grant proposal.	84%	87%
Data sharing best practices and governance.	87%	87%
Monitoring and Evaluation.	87%	87%
Ethical issues related to genetic procedures.	87%	87%
Study close (archiving data, sample storing, notification of closure		
processes).	87%	87%
Best practices regarding referencing and plagiarism.	87%	87%
Understanding the difference between health research and standard		
of care, audit, evaluation.	79%	86%
Qualitative methodologies.	86%	86%





Scientific writing for journal publications.	86%	86%
Teamwork	86%	86%
Developing effective research teams with named roles and		
responsibilities for team	86%	86%
Experimental research.	78%	85%
Qualitative analysis.	85%	85%
Data analysis software (qualitative and quantitative).	80%	85%
Writing a study budget.	84%	85%
How to translate research results into practice within healthcare		
settings.	84%	85%
Critical appraisal of a research paper		85%
Community engagement principles and activities.	unclear	84%
legal issues in research		84%
Governance and regulation.	unclear	83%
Implementation research.	73%	82%
Pharmacovigilance principles and reporting adverse effects.	83%	82%
How to form a research agenda.	unclear	81%
Development of Standard Operating Procedures (SOPs).	82%	81%
Storage of research materials.	83%	81%
Use of citation tools (i.e. Mendeley).	83%	81%
Building trust within a team	84%	81%
Good Participatory Practice (GPP).	unclear	80%
Participant loss to follow-up'.	80%	80%
	0.20/	000/
Authorship in research	83%	80%
		80%
Good Clinical Laboratory Practice (GCLP)	77%	70%
Participants retention strategies	80%	79%
Attrition bias and prevention methods	80%	79%
Research Time management	84%	79%
Rudget management	83%	79%
Building your career in research	82%	78%
Mixed Methods research	79%	76%
	7.570	7070
How to manage expectations of study communities	unclear	76%
Research designs for outbreaks.	81%	75%





	1	
Contingency plans for research studies (in situations like		
pandemics, etc)		75%
How to set up study training		/5%
Mathadalagy Pasaarch (recearch on recearch)	750/	740/
Research registries	/5%	74%
Intellectual property rights		74%
Health Policy and Systems Research	7/%	74/0
Laboratory safety practices	74%	73%
	7170	7170
Laboratory biosafety and how to manage hazards.	81%	71%
Laboratory quality best practices.	71%	70%
How to search for secondary datasets in different databases.	74%	70%
Principles of Big data analysis		70%
Social sciences and anthropological studies.	unclear	69%
Identifying various funding agencies/sources.	75%	68%
Meta-analysis.	70%	67%
Leadership in research.	75%	67%
Laboratory sample handling and storage.	63%	66%
Laboratory standards and regulations.	68%	66%
Ability to communicate and meet with funders.	75%	65%
Quality assurance systems.	78%	65%
Handling and negotiating with a range of stakeholders	66%	63%
		600/
Specific laboratory techniques and equipment handling.	54%	60%
Quality management systems.	80%	60%
	720/	60%
Setting up an etnical review board or committee.	72%	60%
Audit.	76%	59%
Influencing at institutional level to enable research	659/	E 90/
	03%	3676
Leading and managing complex research groups	70%	57%
Research Indexing	, 0, 10	56%
Setting up a research laboratory	48%	55%
		3378
Health economics and economic evaluations.	67%	54%





Medicines Supply and Regulations		54%
Laboratory management.	60%	53%
Operational research.	unclear	52%
Mathematical Modelling.	unclear	50%

Delphi Study Flowchart





Process for developing an evidence-led Essential Research Skills Training Curriculum Delphi Study



Essential Research Skills Training Curriculum





Further information and contact details

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Thank you for being part of this project

