APPLICATION GUIDE FOR NMRC RESEARCH TRAINING FELLOWSHIP (RTF)

A) Aim

The NMRC Research Training Fellowship (RTF) is awarded to outstanding and talented clinicians and health science / healthcare professionals for research training to have qualifications and skills to become Clinician Scientists.

B) Eligibility criteria

1) Applicants must be medical doctors/dental surgeons (i.e., with MBBS/MD/BDS degree) who are registered with the Singapore Medical Council/Dental Board. Residents who wish to pursue research training in the midst of their clinical training will be required to submit additional documents. Medical / House officers are not eligible to apply.
2) Health science / healthcare professionals with non-medical degrees, such as nurses, pharmacists and other allied health professions listed on MOH's website and possess PhD or equivalent degrees are eligible to apply. Those without PhD or equivalent degrees may apply for training leading to a formal postgraduate degree.
3) Applicants must be Singapore citizens or Permanent Residents at point of application.
4) Applicant must hold a primary appointment in a local public hospital/public health institutions/national specialty centre/public university/Academic Medical Centre (AMC) and be salaried by the institution;[1]
5) Applicants must remain employed in a public institution in Singapore during and throughout duration of the award. They will also be required to serve a bond with the Government of Singapore upon the completion of their training.
6) Applicants should not have outstanding reports from NMRC grants and other national grants.
7) Applicants are only allowed up to 2 resubmissions following an unsuccessful first

[1] A*STAR CS scholar from the National Science Scholarship (NSS) (MBBS-PhD) or NSS (MD-PhD) schemes and fulfil the following may apply:

a. hold a primary appointment in a public health institution (PHI), Academic Medical Centre (AMC), or medical school; or
b. hold a primary appointment in A*STAR and a joint appointment in the PHI/AMC/medical school, and the grant application is supported by the PHI/AMC/medical school. The PHI/AMC/medical school is to consider if the applicant is able to demonstrate that he/she can act as a bridge between A*STAR and the healthcare system.

The grant application must be submitted through the PHI/AMC/medical school as the host institution.

submission.

C) Types of Awards

Applicants may apply for (i) local/overseas formal research training or (ii) local/overseas research attachment. Applicants are encouraged to apply for local training if expertise is available locally so that knowledge acquired is applicable in the local context.

i) Local/Overseas Formal Research Training

The curriculum of the formal programme leading to a postgraduate degree or qualification can be research-based or course-based.

Applicants are advised to apply to the training institution and liaise the necessary arrangements for the research training or degree programme concurrently with this fellowship application to avoid delay in the submission of the application and commencement of training.

All applicants must provide a write-up on their research area/focus, to justify how the curriculum / training will enable them to pursue a career as a clinician scientist and to include a 5-year career plan post-training.

For formal course-based training which does not require a research project, applicants need not fill in section C of the research proposal template.

All applicants are also required to nominate a research supervisor/mentor to provide guidance during and after training.

Components of Award:

- **Award value** of up to S$500k per awardee for over 2-3 years (extendable to 4 years for PhD degree). Clinicians pursuing overseas full-time PhD training may request for up to S$800k.
- **Salary support** in accordance to the MOH HMDP terms and NMRC's Annual Salary Cap based on clinical grade (Table 1)
    - For full-time training, the awardee can be allowed up to two clinical sessions (8 hours) per week to maintain clinical competence where necessary based on institution's arrangements
    - For part-time training, the awardee may request for salary support for the time required for research training only. The host institution is to provide salary for the remaining time (i.e. clinical duties).

Table 1: NMRC's Annual Salary Cap by Clinician's Clinical Grade

Clinician's Clinical Grade	Annual salary cap for 1 FTE
Senior Consultant	S$300,000
Consultant	S$200,000
Associate Consultant	S$150,000
Registrar	S$120,000

- **Maintenance allowance** and others (e.g. return air travel, health insurance) in accordance to the MOH HMDP terms and institution's existing guidelines for awardees pursuing overseas training.
- **Tuition or course fees** charged by the training institution
- **Overseas conference support** of up to $6K per year. Allowable only if the awardee is a speaker or presenting a poster at the conference on a topic relevant to the research project under the award. Costs related to conference e.g. maintenance allowance should be indicated as "overseas conference support" under "overseas travel (OT)" vote on IGMS and budgeting should be done in accordance to MOH HMDP terms.
- Eligibility to apply for a research seed funding of up to $30k for duration of 2 years (subject to the approval of a research proposal) via IGMS upon completion of training.

ii) Local/Overseas Research Attachment

Applications for research attachments that encourage collaborations between local institutions, or local institutions with overseas institutions will be prioritised.

All applicants must provide a write-up on their research area/focus, to justify how the curriculum / training will enable them to pursue a career as a clinician scientist and to include a 5-year career plan post-training.

All applicants are also required to nominate a research supervisor/mentor to provide guidance during and after training.

Components of Award:

- **Award value** of up to S$500k per awardee of up to 2 years.
- **Salary support** in accordance to the MOH HMDP terms and NMRC's Annual Salary Cap (Table 1).
- **Maintenance allowance** and others (e.g. return air travel, health insurance) in accordance to the institution's guidelines for awardees going on overseas training.
- **Overseas conference support** of up to $6K per year. Allowable only if the awardee is a speaker or presenting a poster at the conference on a topic relevant to the research project under the award. Costs related to conference e.g. maintenance allowance should be indicated as "overseas conference support" under "overseas travel (OT)" vote on IGMS and budgeting should be done in accordance to MOH HMDP terms.
- Awardee who is supported for 12 months or more for training will be eligible to apply for research seed funding of up to $30k for duration of 2 years (subject to the approval of a research proposal) via IGMS upon completion of training.

D) Bond

Recipients of the RTF are subject to signing a bond to serve the Government of Singapore or as directed by the Government of Singapore. The bonding policy of the NMRC can be found here.

E) Review Procedures

All applications are reviewed by the local selection panel which will provide award recommendations. The review process takes about 4 to 5 months after closure of the call and applicants may be called up for interviews as part of the review process.

F) Reporting requirements

- The awardee will have to provide an annual report to NMRC which sets out what has been achieved and the progress made towards the contributions which had been agreed to at the point of recruitment.
- The awardee is required to submit a final report to NMRC within 3 months from the project completion date.

G) Submission and deadline details

It is **mandatory** for all applications with the endorsement from the Host Institution's Research Director to be submitted to NMRC via IGMS by **24 January 2022, 5pm** (Singapore Time).

Late/incomplete submission or submissions from individual applicants without Director of Research's (DOR) endorsement on the IGMS will not be entertained.

For Residents, please include approval received from the Residency Advisory Committee (RAC), Programme Director (PD) and DIO. The endorsed revised training plans (if applicable) from the PD is also required.

For further information on RTF, please contact Ai Ping at hiu_ai_ping@moh.gov.sg

General Instructions:

Please read the following carefully before completing your application.

- Refer to **Appendix 1** for details on Health Research Classification System (HRCS) to complete “Health Category” and “Research Activity Codes” in the application form.

- Refer to **Appendix 2** for checklist on Study Design and Statistical Considerations to complete “Methods/Approach” in the application form.

- Refer to **Appendix 3** for descriptions on Areas of Research to complete “Area(s) of Research” in the application form.

- The Applicant and the stated Department and Institution shall be the points of contact for NMRC. Applicants with multiple appointments at different institutions are to select only **one** hosting institution for the application.

Appendix 1: HEALTH RESEARCH CLASSIFICATION SYSTEM

The Health Research Classification System is a bespoke system for classifying the full spectrum of biomedical and health research - from basic to applied - across all areas of health and disease. It was developed by the UK Clinical Research Collaboration Partners. It is supported by an online reference source and manual - http://www.hrcsonline.net/".

Health Categories

Category	Includes
Blood	Haematological diseases, anaemia, clotting and normal development and function of platelets and erythrocytes
Cancer	All types of cancers (includes leukaemia)
Cardiovascular	Coronary heart disease, diseases of the vasculature and circulation including the lymphatic system, and normal development and function of the cardiovascular system
Congenital Disorders	Physical abnormalities and syndromes that are not associated with a single type of disease or condition including Down's syndrome and cystic fibrosis
Ear	Deafness and normal ear development and function
Eye	Diseases of the eye and normal eye development and function
Infection	Diseases caused by pathogens, acquired immune deficiency syndrome, sexually transmitted infections and studies of infection and infectious agents
Inflammatory and Immune System	Rheumatoid arthritis, connective tissue diseases, autoimmune diseases, allergies and normal development and function of the immune system
Injuries and Accidents	Fractures, poisoning and burns
Mental Health	Depression, schizopnrenia, psychosis and personality disorders, addiction, suicide, anxiety, eating disorders, learning disabilities, autistic spectrum disorders and studies of normal psychology, cognitive function and behaviour
Metabolic and Endocrine	Diabetes, thyroid disease, metabolic disorders and normal metabolism and endocrine development and function
Musculoskeletal	Osteoporosis, osteoarthritis, muscular and skeletal disorders and normal musculoskeletal and cartilage development and function
Neurological	Dementias, transmissible spongiform encephalopathies, Parkinson's disease, neurodegenerative diseases, Alzheimer's disease, epilepsy, multiple sclerosis and studies of the normal brain and nervous system
Oral and Gastrointestinal	Inflammatory bowel disease, Crohn's disease, diseases of the mouth, teeth, oesophagus, digestive system including liver and colon, and normal oral and gastrointestinal development and function
Renal and Urogenital	Kidney disease, pelvic inflammatory disease, renal and genital disorders, and normal development and function of male and female renal and urogenital system
Reproductive Health and Childbirth	Fertility, contraception, abortion, *in vitro* fertilisation, pregnancy, mammary gland development, menstruation and menopause, breast feeding, antenatal care, childbirth and complications of newborns
Respiratory	Asthma, chronic obstructive pulmonary disease, respiratory diseases and normal

	development and function of the respiratory system
Skin	Dermatological conditions and normal skin development and function
Stroke	Ischaemic and haemorrhagic
Generic Health Relevance	Research applicable to all diseases and conditions or to general health and wellbeing of individuals. Public health research, epidemiology and health services research that is not focused on specific conditions. Underpinning biological, psychosocial, economic or methodological studies that are not specific to individual diseases or conditions
Other	Conditions of unknown or disputed aetiology (such as chronic fatigue syndrome! myalgic encephalomyelitis), or research that is not of generic health relevance and not applicable to specific health categories listed above

Overview of the Research Activity Codes

1	**Underpinning Research**
1.1	Normal biological development and functioning
1.2	Psychological and socioeconomic process
1.3	Chemical and physical sciences
1.4	Methodologies and measurements
1.5	Resources and infrastructure (underpinning)
2	**Aetiology**
2.1	Biological and endogenous factors
2.2	Factors relating to physical environmental
2.3	Psychological, social and economic factors
2.4	Surveillance and distribution
2.5	Research design and methodologies
2.6	Resources and infrastructure
3	**Prevention of Disease and Conditions, and Promotion of Well-Being**
3.1	Primary prevention interventions to modify behaviours or promote well-being
3.2	Interventions to alter physical and biological environmental risks
3.3	Nutrition and chemoprevention
3.4	Vaccines
3.5	Resources and infrastructure (prevention)
4	**Detection, Screening and Diagnosis**
4.1	Discovery and preclinical testing of markers and technologies
4.2	Evaluation of markers and technologies
4.3	Influences and impact
4.4	Population screening
4.5	Resources and infrastructure (detection)
5	**Development of Treatments and Therapeutic Interventions**
5.1	Pharmaceuticals
5.2	Cellular and gene therapies
5.3	Medical devices
5.4	Surgery
5.5	Radiotherapy
5.6	Psychological and behavioural
5.7	Physical
5.8	Complementary
5.9	Resources and infrastructure (development of treatments)
6	**Evaluation of Treatments and Therapeutic Interventions**
6.1	Pharmaceuticals
6.2	Cellular and gene therapies
6.3	Medical services
6.4	Surgery
6.5	Radiotherapy
6.6	Psychological and behavioural
6.7	Physical
6.8	Complementary
6.9	Resources and infrastructure (evaluation of treatments)
7	**Management of Diseases and Condition**
7.1	Individual care needs
7.2	End of life care

7.3 Management and decision making
7.4 Resources and infrastructure (disease management)

8 Health and Social Care Services Research

8.1 Organisation and delivery of services
8.2 Health and welfare economics
8.3 Policy, ethics and research governance
8.4 Research design and methodologies
8.5 Resources and infrastructure (health services)

Research Activity Codes

1. Underpinning Research	**Research that underpins investigations into the cause, development, direction, treatment and management of diseases, conditions and ill health**
1.1 Normal biological development and functioning	Studies of normal biology including - genes and gene products - molecular, cellular and physiological structures and function - biological pathways and processes including normal immune function - developmental studies and normal ageing - bioinformatics and structural studies - development and characterisation of model systems
1.2 Psychological and socioeconomic process	Studies that do not address health directly but cover issues that may have a bearing on health and well-being including - perception, cognition and learning processes - social and cultural beliefs - individual or group characteristics and behaviours - politics, economies and urban development - development and characterisation of model systems
1.3 Chemical and physical sciences	Research in chemical and physical sciences that may lead to the future development of diagnostic tools or medical treatments including - bioengineering and biophysics - chemical structures, interactions and properties - molecular modelling - material science
1.4 Methodologies and measurement	Development of novel underpinning research measures and analytical methodologies including - development of statistical methods and algorithms for genomic analysis - development of mapping methodologies and novel data comparison methods - development of biological, psychological and socioeconomic research measures
1.5 Resources and infrastructure (underpinning)	- development and/or distribution of resources for use by the research community including equipment, cell lines, DNA banks, and genomic and proteomic sequence resources - infrastructure to support research networks, consortia and centres

Research Activity Codes

2 Aetiology	**Identification of determinants that are involved in the cause, risk or development of disease, conditions and ill health**
2.1 Biological and endogenous factors	Identification and characterisation of endogenous factors known or suspected to be involved in the cause, risk or development of disease, conditions or ill health including - genes and gene products, molecular, cellular and physiological structures and functions - biological factors linked to ethnicity, age, gender, pregnancy and body weight - endogenous biological factors or pathways involved in responses to infection or damage by external factors - metastases, degenerative processes, regeneration and repair - complications, reoccurrence and secondary conditions - bioinformatics and structural studies - development and characterisation of models
2.2 Factors relating to physical environment	Environmental or external factors associated with the cause, risk or development of disease, conditions or ill health including - physical agents, occupational hazards, environmental surroundings, radiation and pollution - chemicals and nutrients - infection by pathogens and studies of infectious agents
2.3 Psychological, social and economic factors	Research into psychological conditions, or research into the cause, risk or development of disease, conditions or ill health associated with social, psychological and economic factors including - individual or group behaviours and lifestyle - cultural or religious beliefs or practices - ethnicity, age and gender differences - socioeconomic factors
2.4 Surveillance and distribution	Observational studies, surveys, registries. and studies that track incidence, prevalence, morbidity, co-morbidity and mortality including ongoing monitoring of large scale cohorts
2.5 Research design and methodologies (aetiology)	Development of aetiological and epidemiological research designs, measures and methodologies including - methodological innovation and modelling complex epidemiological data - development and evaluation of novel research designs - development of epidemiological research measurements including outcome measures - development of analytical and statistical methods to understand

	disease cause, susceptibility and risk including genetic linkage and association studies
2.6 Resources and infrastructure (aetiology)	development and/or distribution of resources for general use by the research community including equipment, cell lines, tissue and DNA banks, and genomic and proteomic sequence resources infrastructure to support research networks, consortia and centres

Research Activity Codes

3 Prevention of Disease and Conditions, and Promotion of Well-Being	**Research aimed at the primary prevention of disease, conditions or ill health, or promotion of well-being**
3.1 Primary prevention interventions to modify behaviours or promote well-being	Development, implementation and evaluation of interventions to modify personal or group behaviours and lifestyles affecting health and well-being including - risk behaviours associated with diet, tobacco use, physical activity, alcohol consumption, sexual health and substance misuse - age, gender, cultural or religious practices - public health policy, health communication and educational interventions - behavioural, psychological, social and physical interventions
3.2 Interventions to alter physical and biological environmental risks	Development, implementation and evaluation of interventions surrounding physical, biological and environmental risk factors including - radiation, second-hand smoke, physical and chemical agents, - occupational hazards and environmental surroundings - contraceptive devices - infectious agents - policy, educational and physical interventions
3.3 Nutrition and chemoprevention	Research on chemopreventative agents and health protective effects of nutrients including - development, characterisation and mechanism of action - chemical contraceptives - testing and evaluation in model systems and clinical, applied and community settings - evaluation of evidence to inform policy
3.4 Vaccines	Research on vaccines for prevention of disease including - discovery, development and testing of vaccines and vaccination in model systems - mechanism of action - development, implementation and evaluation of vaccination programmes and studies to increase uptake - decision making, outcomes from vaccination and evaluation of evidence to inform policy
3.5 Resources and infrastructure (prevention)	- development and/or distribution of resources for use by the research community including equipment, ceil lines, tissue and DNA banks - infrastructure to support research trials, networks, consortia and centres

Research Activity Codes

4 Detection, Screening and Diagnosis	**Discovery, development and evaluation of diagnostic, prognostic and predictive markers and technologies**
4.1 Discovery and preclinical testing of markers and technologies	Discovery, development and preclinical testing of novel markers (that may be derived from patient samples) and technologies for use in detection, diagnosis, prediction, prognosis and monitoring including - biological and psychological markers - diagnostic and monitoring devices, imaging, scanning, predictive and - diagnostic tests - development and characterisation of models - diagnostic measures and methodologies
4.2 Evaluation of markers and technologies	Testing and evaluation of markers and technologies in humans for use in detection, diagnosis, prediction, prognosis and monitoring in clinical, community or applied settings including - assessment of sensitivity, efficacy, specificity. predictive and prognostic value, reproducibility and safety - medical devices, imaging, diagnostic and predictive tests - evaluation of diagnostic models, methods and methodologies in clinical or applied settings
4.3 Influences and impact	Studies investigating impact of screening and factors affecting uptake including - attitudes and beliefs including cultural and religious practices - issues relating to gender, age and ethnicity - genetic counselling and decision making - psychological, social and economic factors - development, implementation and evaluation of interventions to promote screening including policy, education and communication
4.4 Population screening	Studies investigating population screening programmes including - feasibility studies, pilot studies and trials - evaluation of effectiveness, benefits and economic evaluation - impact on health services and policy issues - models of population surveillance
4.5 Resources and infrastructure (detection)	- development and/or distribution of resources for use by the research community including equipment, cell lines, tissue and DNA banks, and informatics systems - infrastructure support for research trials, networks, consortia and centres

Research Activity Codes

5 Development of Treatments and Therapeutic Interventions	**Discovery and development of therapeutic interventions and testing in model systems and preclinical settings**
5.1 Pharmaceuticals	Identification and development of pharmaceutical small molecules, therapeutic vaccines, antibodies and hormones including - drug screening and development of delivery systems - mechanism of action including side effects and drug resistance - pharmacogenetics, prediction of genetic variation and responses to drugs - testing in in vitro and in vivo model systems
5.2 Cellular and gene therapies	Discovery and development of cellular, tissue and gene therapies including - gene therapy, stem cells therapy, in vitro fertilisation and tissue engineering - development of delivery systems - development of culture systems - testing in in vitro and in vivo model systems
5.3 Medical devices	Discovery and development of medical devices including - implantable devices, mobility aids, dressings, medical equipment and prostheses - biological safety assessments and investigation of adverse events - sterilisation and decontamination of equipment or surfaces - testing in in vitro and in vivo model systems
5.4 Surgery	Development of surgical, obstetric and dental interventions including - histocompatability, transfusions, transplantations including xenograft studies and bone marrow transplants - mechanisms of recovery, tolerance, rejection and side effects including infection - testing in in vitro and in vivo model systems
5.5 Radiotherapy	Discovery and development of interventions including - radiobiology, radiotherapy, radioimmunotherapy, radiosensitisers, microwaves, ultrasound, laser and phototherapy - development of delivery systems - investigation of mechanisms of action and side effects - testing in in vitro and in vivo model systems
5.6 Psychological and behavioural	Development of psychological and behavioural interventions including - cognitive behavioural therapy, electro-convulsive therapy, counselling, therapy and social interventions - testing in model systems
5.7 Physical	Development of physical interventions including - physical therapies, physiotherapy, occupational therapy, speech therapy, dietetics, exercise and osteopathy - mechanisms of action

	➕ testing in model systems
5.8 Complementary	Discovery and development of complementary approaches to conventional medical therapies including ➕ hypnotherapy, meditation, massage, acupuncture and homeopathy ➕ mechanisms of action ➕ testing in model systems
5.9 Resources and infrastructure (development of treatments)	➕ development and/or distribution of resources for general use by the research community including equipment, cell lines, tissue and DNA banks ➕ infrastructure support for networks, consortia and centres

Research Activity Codes

6 Evaluation of Treatments and Therapeutic Interventions	Testing and evaluation of therapeutic interventions in clinical community or applied settings
6.1 Pharmaceuticals	Clinical application and evaluation of pharmaceutical small molecules, therapeutic vaccines, antibodies and hormones in humans including - small scale settings and pilot studies - phase I, II, III and IV trials - assessing sensitivity, efficacy, specificity, relapse, survival, therapeutic value, pharmacokinetics, reproducibility and safety - studies monitoring response, outcome, drug resistance and side effects
6.2 Cellular and gene therapies	Clinical application and evaluation of cellular, tissue and gene therapies in humans including - small scale and pilot studies - phase I, II, III and IV trials - gene therapy, stem cell therapy, in vitro fertilisation, tissue engineering - evaluation of applied delivery systems
6.3 Medical devices	Application and evaluation of medical devices in humans in a clinical, community or applied setting including - implantable devices, mobility aids, dressings, medical equipment and prostheses - validation of design and post market surveillance
6.4 Surgery	Clinical and applied application and evaluation of surgical, obstetric and dental interventions in humans including - small scale and pilot studies - phase I, II, III and IV trials - procedures including organ and bone marrow transplantation, tissue grafts and transfusions - monitoring outcomes, side effects and rejection
6.5 Radiotherapy	Clinical application and evaluation of interventions in humans including - small scale and pilot studies - phase I, II, III and IV trials - radiotherapy, radioimmunotherapy and radiosensitisers, microwaves, ultrasound, laser and phototherapy - monitoring side effects
6.6 Psychological and behavioural	Application and evaluation of psychological and behavioural interventions in humans in clinical, community and applied settings - phase I, II, III and IV trials - cognitive behavioural therapy, electro-convulsive therapy, counselling, therapy and social interventions
6.7 Physical	Testing and evaluation of physical interventions in humans in a clinical, community or applied setting including - physical therapies, physiotherapy, occupational therapy, speech therapy, dietetics, osteopathy and exercise

6.8 Complementary	All aspects of testing, evaluation and provision of complementary approaches to conventional medicine in humans in a clinical, community or applied setting including - hypnotherapy, massage, acupuncture and homeopathy - issues relating to health and social services and health care delivery - attitudes and beliefs of patients and health care professionals
6.9 Resources and infrastructure (evaluation of treatments)	- provision and distribution of resources related to clinical and applied therapeutic interventions - infrastructure support for clinical and applied research networks and trials, consortia and centres

Research Activity Codes

7 Management of Diseases and Condition	**Research into individual care needs and management of disease, conditions or ill health**
7.1 Individual care needs	Studies of patients and service user care needs including - quality of life, management of acute and chronic symptoms, management of side effects, rehabilitation, long term morbidity and reproductive issues - psychological impact of illness - social and economic consequences of ill health - behaviour affecting disease management including secondary - prevention, compliance to treatment and attitudes and beliefs relating to seeking treatment - assessment of social care and health services needs - educational or communication interventions to promote self-care or improve health care by carers - impact on carers
7.2 End of life care	Studies involving all issues related to palliative care and end of life care including - assessment of patient, service user and carer needs - provision and evaluation of palliative and end of life care services - quality of life for patients and carers - evaluation of interventions for health and social care professionals - social, economic and policy issues - pain management for terminally ill people - bereavement
7.3 Management and decision making	conditions by health and social care professionals - attitudes, beliefs and behaviours of health and social care professionals - investigation of decision making including factors influencing diagnosis, treatment, referral and management strategies - educational interventions and communication practices - development of guidelines, interventions or models to assist decision making and management, including identifying symptoms, predicting outcomes and identifying individuals at risk - testing and evaluating management regimes and strategies
7.4 Resources and infrastructure (disease management)	development and/or distribution of resources and equipment for use by the community including informatics systems - infrastructure support for trials, networks, consortia and centres

Research Activity Codes

8 Health and Social Care Services Research	**Research into the provision and delivery of health and social care services, health policy and studies of research design, measurements and methodologies**
8.1 Organisation and delivery of services	Examining the organisation and provision of health and social care services and evaluating factors affecting the quality of care - workforce and career issues - organisation and management of services - access to health and social care and geographical variations in outcomes - effectiveness of different care settings and models of service delivery - evaluating quality of care including patient safety issues - evaluation of experiences of service users - assessment of current and future health care demands - development and evaluation of interventions to improve services
8.2 Health and welfare economics	Economic evaluation of health and social care interventions and delivery including - cost-benefit analysis of services including economic modelling - cost effectiveness or economic feasibility of implementing new interventions or technologies within health services - economic assessment of service productivity and outcomes - health care costs - development and evaluation of economic models of health care
8.3 Policy. ethics and research governance	- evaluation of local, regional and national healthcare policy - impact of legislation - synthesis and evaluation of evidence to inform policy - dissemination and implementation of research evidence - research ethics including use of personal data and biological material, consent and confidentiality - research governance and regulation processes including interpretation of guidelines - issues surrounding research subjects and donor recruitment
8.4 Research design and methodologies	Development of research designs and novel methodologies for health care including treatment, management and health services research - analytical innovation, methodological research, statistical methods and modelling

	development of research measurements including outcome measures development of methods of research assessment and evaluation development and evaluation of research designs and methodologies
8.5 Resources and infrastructure (health services)	development and distribution of resources for use by the community including informatics systems infrastructure support for networks, trials, consortia and centres

*Appendix 2: Study Design and Statistical Considerations * - Checklist*

All applicants must give careful thought to the following study design, methods and statistical considerations, and ensure that they are reflected in the grant application. Consider the following questions for the clinical research study design and methodological planning.

1. Is the main objective exploratory (for which a formal sample size justification is not relevant) or are you testing a quantitative hypothesis?
2. If the former, what are the population parameter/s you are trying to estimate? (E.g. annual incidence of AIDS, prevalence of teenage smokers, relative risk of a relapse etc)
3. If the latter, use the checklist below which could assist you to describe your study design and methods more clearly.
4. Some sample questions related to the check list below: (a) State the primary quantitative hypothesis (e.g. the hazard ratio is 0.5) and the required precision for the estimate in the form of a confidence interval e.g. 95% CI of the HR (0.3, 0.7)? (b) State the sample size required to achieve that precision. Be sure to specify the type 1 error, any other required assumptions needed and the sample size software / formula used in the calculation.

The following checklist provides guidelines for describing the study and design and methods as adapted from the CONSORT statement[2].

Area	Descriptor	Y/N/NA
Participants	Eligibility criteria for participants' description of settings/ locations where data are collected.	
Recruitment Methods	How will subjects be identified, enrolled and retained?	
Interventions	Detail the interventions intended for each group and how, when and by whom they are to be administered.	
Objectives hypotheses	Provide specific objectives or aims and related specific hypotheses.	
Outcomes	Clearly define primary and secondary outcome measures, AND when applicable, methods to enhance measurements quality (*e.g.*, multiple observations, assessor training).	
Sample size	How was sample size determined ? When applicable, explain any interim analyses and stopping rules.	
Randomization - Sequence generation	Method used to generate the random allocation sequence, and any restrictions (*e.g.*, blocking, stratification)	
Randomization - Allocation concealment	Method used to implement the random allocation sequence (*e.g.*, numbered containers or central telephone). Clarify whether the sequence will be concealed until interventions to be assigned.	
Randomization - Implementation	Who will generate the allocation sequence, who will enroll participants, and who will assign participants to their groups	
Blinding	How was blinding of the assigned treatment achieved for (i) subjects (ii) care-givers (iii) outcome assessors?	
Data collection	Outline how data will be collected, stored, managed. How will you	

[2] The CONSORT is primarily for randomized controlled trials, but nevertheless has many features that would apply more generally to other types of clinical research projects. Visit http://www.consort-statement.org/index.aspx?o=1017 for more details.

	ensure data quality (e.g. rater drift)?	
Adverse Events	How detected, measured, and managed?	
Study Period	When will enrollment start, stop, when is last data point?	
Statistical analyses for each hypothesis	What specific statistical analysis is planned for each primary and planned secondary hypothesis?	
Statistical Collaboration	Who provides design and statistical collaboration	

Appendix 3:
Areas of Research

S/N	Areas of Research	General Description
1	Artificial intelligence (AI)	Generally refers to intelligence demonstrated by machines. In healthcare, AI applications are commonly algorithmic (i.e., evidence based approaches programmed by researchers or clinicians). The computer algorithms are created to be able to approximate human cognition in the analysis of complex medical data without direct human inputs. The primary aim of health-related AI applications is to analyse relationships between prevention or treatment techniques and patient outcomes. E.g., AI uses include robot-assisted surgery, monitoring of images or patient data to aid in disease detection etc
2	Digital health	Use of infocomm technologies to help address the health problems and challenges faced by patients, and include hardware and software solutions and services. Generally, it refers to the development of interconnected health systems which could improve the use of computational technologies, smart devices, computational analysis techniques and communication media, so as to aid healthcare professionals and patients manage illness and health risks as well as promote health and wellbeing.
3	Data science and data analytics	Data science involve dealing with structured or unstructured data, similar to data mining. It is multidisciplinary, involving statistics, mathematics, programming etc, to extract insights and information from data. Data analytics involves the application of algorithmic or mechanical process to examine raw data, with the purpose of drawing conclusions about the information. E.g., Could be used to optimize hospital operations in its planning, management, measurement etc.
4	Epidemiology, Population Health	Epidemiology - Study and analysis of the distribution (who, when and where), patterns and determinants of health disease conditions in defined populations. Population Health Research - Investigation and analysis of factors that influence the health status of population groups, or whole populations, as well as the testing and evaluation of policies and interventions to improve health outcomes
5	Family Medicine and Primary Care	Studies of comprehensive healthcare provided in the community for people of all ages where they make initial approach to a medical practitioner or clinic for advice or treatment. E.g. Research on better management of patients with chronic and/or multiple diseases and support for their caregivers etc.
6	Healthy and Meaningful Longevity	Research that aims to promote healthy and meaningful longevity, with long-term outcomes in areas like extending health and functional lifespan, reducing incidence of preventable conditions and improving overall well-being (physical, social and mental well-being) of our seniors.
7	Implementation Science	Scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and hence, to improve the quality and effectiveness of health services.
8	Precision Medicine	Generally refers to the customisation of medical treatments and clinical care to specific patient groups, based on their underlying clinical, socio-demographic or genetic profiles.
9	Medical Technology (MedTech) innovations	Novel technologies that diagnose, treat and/or improve human health. They can address intractable healthcare challenges and improve healthcare delivery, contributing to healthcare outcomes and better overall health of the people, and come in many forms, from medical devices and equipment to diagnostic kits and software.