



Australian and New Zealand College of Anaesthetists

Faculty of Pain Medicine

Project Grant Application Guide (including Simulation/Education Grant)

2021

ADVICE AND INSTRUCTIONS TO APPLICANTS

To be used in conjunction with Project Grant
Application Form

CLOSING DATE: 5 PM AEDT April 1, 2020

Email applications to:
ANZCA Research and Administration Coordinator
research@anzca.edu.au

IMPORTANT POINTS FOR COMPLETING ANZCA GRANT APPLICATIONS

- Please read the ANZCA Research Grant Policy before completing the application form (<http://www.anzca.edu.au/fellows/Research/anzca-research-information.html>)
- An ANZCA REGKEY must be obtained and included in the header of the application form. Double-click on the header to add your REGKEY. Contact Susan Collins (email: research@anzca.edu.au) to obtain your REGKEY.
- Do not include or copy the cover sheet. Start your application with the page headed “In confidence”.
- Ensure chief investigator A is a fellow or registered trainee of ANZCA or FPM.
- Ensure all chief investigators do not exceed the two active grants or applications maximum.
- Ensure the research plan is no more than 7 pages, including references with a font size no smaller than 10 point. The minimum margin is 2cm. Ensure the budget is in line with the maximum amounts allowed.
- Rows may be added to tables where this is allowed in these guidelines (e.g. list of chief investigators, list of current research grants). Do not exceed prescribed word/page counts. Text that exceeds prescribed word counts will not be considered.
- Ensure that each page is numbered consecutively in the application.
- A written quotation for equipment costing \$A10,000 or more, as requested in the budget section, must be attached to each copy of the application.
- The application must be submitted **electronically via email** to research@anzca.edu.au. Only files of 6MB or less will be accepted. The electronic copy may include the signature pages within the application form or these may be sent via email as a separate document with scanned or electronic signatures.
- Electronic copies must be in PDF format (converted word files only, not scanned documents) or Microsoft word format. Note for older versions on Microsoft Word please install the official update from <https://www.microsoft.com/en-au/download/details.aspx?id=7>
This update will allow Microsoft office 2007 to save documents to .PDF format.
- The complete application must be received by the Research and Administration Coordinator by 5PM AEDT on the closing date for applications. Late applications WILL NOT BE ACCEPTED.
- Incomplete applications or those that do not follow these guidelines WILL NOT BE ACCEPTED.
- ANZCA cannot amend an application once it has been submitted.

A. CONDITIONS OF ANZCA GRANTS

1 Payment

Sums awarded will be paid upon request after **January 1** each year for the duration of the grant. All payments will be made in Australian dollars, upon receipt of a fully correct tax invoice from the administering institution.

2 Conditions of professional research personnel

The conditions for professional research personnel shall be those of the institution in which the work is carried out or as the college may determine in particular circumstances. This includes annual leave and sick leave. However, the college does not provide for long service leave.

3 Alterations in research program budget

The CIA is expected to adhere to the approved research program or budget, and to notify any absences other than for short periods (e.g. three to four weeks). Full details of any proposed major alterations to either program or budget, or of any absences during the course of the grant, must be submitted in advance by the CIA to the Research and Administration Coordinator for approval by the chair of the Research Committee (or his or her delegate).

4 Reporting requirements

Eligibility to apply for future funding will be contingent on complying with the reporting requirements of the ANZCA Grant Agreement Terms and Conditions. Unless otherwise specified, grants are awarded for the period of two calendar years following the year of the grant decision. The CIA may request in writing a time-only extension or roll-over of funds if the project is not completed at the end of the two-year period.

4.1 Progress report

The CIA is required to forward a progress report on the approved form to the college, by **September 1** in each year of the award. This form can be found on the ANZCA website. If a progress report is not received by the due date, any funding for multi-year projects may be withheld and/or any future funding requested in subsequent years by the CIA may not be considered.

4.2 Final report

The CIA is required to forward a final report on the approved form to the college, within three months of the completion of the project. This form can be found on the ANZCA website. The final report must include a statement of expenditure charged to the grant. Any unexpended balance of the grant must be returned to the college and not be used on other projects.

5 Publications and presentations

The college requires that its contribution be acknowledged in all publications and presentations of the research project, for example *"This study was supported by a grant from the ANZCA Research Foundation; Australian and New Zealand College of Anaesthetists"* and that a presentation relating to the project be made at a major college meeting. A hard copy or pdf of the reprint must be sent to the Research and Administration Coordinator. If the protocol is registered with a journal or other relevant organisation, the college must receive a copy of the registration certificate.

6 Patents

Any discovery arising out of work supported by the college must not be the subject of application for patent except with the written approval of the college and the agreement of the institution in which the work is carried out.

7 Audit of research projects

In accordance with the ANZCA Academic Integrity Policy, available on the website, ANZCA reserves the right to conduct a random audit of ANZCA-funded research through the administering institution's research office.

8 Termination of grant

A grant may be terminated if the conditions of the grant are not observed. A grant will terminate, unless other arrangements satisfactory to the college are made, if the CIA leaves the institution before the expiry of the grant. In such an eventuality, the recipient and the head of the department are expected to notify the college CEO. When a grant terminates any unexpended balance must be returned to the college.

B. GENERAL INFORMATION FOR APPLICANTS

1 Introduction

Funding for medical research in Australia, New Zealand, Hong Kong, Malaysia and Singapore is necessary if medical science is to maintain a high international standing. The most important single national source of funding for medical research in Australia is provided by the Commonwealth government through the Medical Research Endowment Fund, which is administered by the National Health and Medical Research Council (NHMRC). In New Zealand, funding is administered by the Health Research Council (HRC).

The NHMRC provides the opportunity for individuals or research teams to obtain support for research projects in all fields of public health, medicine and dentistry in Australia, through the Project Grant and Fellowship schemes. In New Zealand the HRC serves an equivalent role. The award of a project grant is ANZCA's main avenue for the support of projects in biomedical research in universities, medical schools, hospitals and other research institutions. The purpose of such schemes is to provide support for work on problems which are capable of solution in a relatively short period of time. ANZCA aims to supplement, complement, and in some cases act as an alternative to NHMRC/HRC. Wherever possible and appropriate ANZCA encourages applicants to also apply to HRC or NHMRC, or to the appropriate body in their home country.

2 Grants

Project Grants and Simulation/Education Grants are awarded to support research proposed by fellows of ANZCA, or FPM and their collaborators (trainees, scientists, students etc). The policy in relation to chief investigators is:

- The "chief investigator A" (i.e. the first-named investigator) must be a fellow or registered trainee of ANZCA or FPM, be financial and in good standing with ANZCA.
- If "chief investigator A" is a registered trainee, one of the other chief investigators must be a fellow of ANZCA or FPM or another suitable supervisor with qualifications acceptable to the Research Committee.
- For Project Grants, other chief investigators may include fellows or registered trainees of ANZCA or FPM, other medical practitioners, healthcare professionals, scientists, research students, professional research personnel etc.

An individual may only be named as a chief investigator or professional research person on a **maximum of TWO active grants and/or applications** in any one year. This maximum includes any grant application which was approved for multi-year funding in previous grant rounds and is still current – a multi-year grant will count as one active grant in each year that it is paid. This provision includes Project Grants, Novice Investigator Grants, the Simulation/Education Grant and the Academic Enhancement Grant. It does NOT include the Douglas Joseph and Lennard Travers Professorships, which may be considered and awarded in addition to two active grants or applications. If, however, an applicant wishes an unsuccessful professorship application to be considered for a project grant and has indicated this by ticking the box on the professorship application form then when this occurs it will count as one of the two allowed active grants or applications for that round. Fellows and registered trainees must be financial and in good standing with ANZCA or FPM.

Applicants should note that an application should only be made in one of the three main grant categories. Should a submission of the same application be made in two grant categories, the applicant may be contacted and requested to identify which one of the submissions they want to be considered by the Research Committee.

Funding is available for research either wholly or partly conducted overseas by fellows and registered trainees under the following conditions:

1. A fellow must have a certified ongoing appointment in Australia, New Zealand, Hong Kong, Malaysia or Singapore.
2. A trainee must return to Australia, New Zealand, Hong Kong, Malaysia or Singapore to complete their training program or return to a guaranteed specialist appointment.
3. The researcher who is conducting research overseas must be a chief investigator.

4. The research proposed would normally be completed during the tenure of the grant.
5. The applicant must demonstrate in the application how the project will benefit research in Australia, New Zealand, Hong Kong, Malaysia and/or Singapore.

The investigation will have objectives of mutual interest to ANZCA, the recipient institution, and the investigator. Whilst the grants may specify financial support for individual professional research personnel, the institutions are responsible for administration of the grant.

4 Other funding agencies

Liaison between ANZCA and other major funding bodies, both government and private, has been established to preclude duplication of support for identical proposals, as far as possible.

5 Procedure for evaluation of grant applications

The procedure for the evaluation of ANZCA grant applications is modelled on the NHMRC review process. Each application is assessed by three reviewers, one of whom is a spokesperson appointed from the Research Committee, who have been carefully chosen for their expertise in relation to the particular grant application.

To assess the scientific merit of the project and to determine the ability of the investigators to carry out the research, reviewers are requested to (i) rate the grant application and (ii) provide a written report.

Applications are rated on a seven-point scale (ranging from “outstanding” through to “poor”) against a set of six research criteria (track record, scientific merit, originality, design/methods, feasibility and international competitiveness).

The written report addresses the scientific merit of the application (originality of hypothesis, substantiation of objective, soundness of research plan and methodology, and feasibility of the project), the track record of the applicant and the budget, and raises questions on areas of the research which require clarification, including problems and limitations likely to be encountered. The written report is forwarded to the applicant for comment. **Applicant responses are limited to three pages only with a 12pt font and a minimum of 1.5cm margins. Pages in excess of the three page limit will not be considered.** Applicants may make minor amendments to their protocol provided these do not constitute substantive revisions to the entire protocol and study design. These amendments should be noted in the three page applicant response, but does not require an amended copy of the protocol or study design to be resubmitted with the three page applicant response. If major changes are made, they will not be considered by the Research Committee, and the applicant will be advised that their study should be resubmitted as a new project in the following year’s grant round. If the applicant responses are not received by the due date, they will not be considered in the ranking of the application.

The Research Committee then meets and considers all the materials, as presented by the spokesperson. At this time, the spokesperson will highlight and comment on any discrepancies between reviewers’ numerical rankings and any inadequacies or inconsistencies in the reviewers written reports that should be considered. Such reports are then considered further by committee members before a final ranking is determined. Using a blinded voting system, each member allocates a score out of seven to the grant. The committee support officer tallies these scores and the final ranking of each grant application is determined. The Research Committee determines a rating score as a cut-off point, below which funding is not available. Those applications that are close to the cut-off score are considered in more detail. Applications identified to receive grants are then further considered to determine the level of funding to be awarded.

Awards of grants will be announced by October of each year. No payment of the grant will be made until written communication accepting the offer and agreeing to the conditions, and a fully correct tax invoice, are received by the College, and all necessary clearances have been obtained. Funding is made available after January 1 in the following year until December 31 unless an extension of time is successfully requested via the ANZCA Research Committee.

Successful grant applicants will be expected to participate in reviewing ANZCA grant applications in future years as a condition of accepting the grant.

6 Confidentiality

Applications for grants are received by ANZCA on an “IN CONFIDENCE” basis. This means that the application document will not be released other than in compliance with any waiver or consent given by the applicant.

7 Applications to philanthropic trusts and foundations for research grants

Through the ANZCA Research Foundation, submissions may be made to funding bodies in the philanthropic sector for successful and highly ranked grant applications awarded through the ANZCA peer-reviewed grant process. It should be noted that approved grant funding through the peer-review process is not dependent on an application to the philanthropic sector. Final confirmation of ANZCA funding is subject to completion of any external funding applications for this project that are in progress. The aim of such applications is to continue to increase the pool of available funds for future ANZCA research projects. If an ANZCA grant application is deemed a suitable match to the specific interests of a particular trust or foundation, approval of the CIA will be sought for a submission to be made. The CIA’s input and advice would be sought during the application process. Acceptance of philanthropic trust or foundation support will usually require acknowledgement of that support in publication or presentation of research. This is in addition to the requirement to acknowledge any support provided by ANZCA.

C. GRANT INFORMATION FOR APPLICANTS

Project grants

The maximum amount available for a project grant, including the simulation/education grant, is **\$A70,000 for year one and \$A50,000 for year two**. Unless otherwise specified, grants are awarded to be completed in the period of up to two calendar years following the year of the grant decision. Multi-year funding grants are available for a second year of additional funding only with the second year capped at \$A50,000. Therefore the maximum amount that can be applied for is \$A120,000. However applications requesting multi-year funding must meet a higher ranking criterion as determined by the Research Committee. If the Research Committee deem a grant to be fundable, but it does not meet the higher ranking, the application will be approved for one year funding only.

If an applicant applies for multi-year funding, the feasibility of the study, specifically in relation to its multi-year timeframe and funding requirements, must be appropriately addressed in their application.

While multi-year grant funding is acceptable, funding for the same research project cannot be split between multiple grants in a single year. The Research Committee will reserve the right to exclude one or both applications if it determines that two applications from the same investigator are in fact for different aspects of the same research project. (This does not prevent the submission of a project grant which is for a project that is also included in an application in the Academic Enhancement Grant category; however only one of these grants will be made in such a case).

Please note that funds for subsequent years will only be made available if a satisfactory report on the progress of the grant is provided by September 1 each year. At its discretion, the Research Committee may elect to fund the first year of a grant only and require the applicants to submit a complete project grant application requesting funding for subsequent years.

Scholarships

Scholarship grants are currently made within the ANZCA project grant scheme. The fellow or registered trainee seeking salary support must be: 1) the chief investigator or one of a group of chief investigators seeking support for a scientific investigation; 2) a fellow or trainee of ANZCA or FPM; 3) enrolled in a higher degree (i.e. MD or PhD) and 4) normally working full-time on the research (0.8 FTE or more). Half-time research may be negotiated on a pro-rata basis upon application. The maximum amount available for a project grant that includes a scholarship grant is \$A90,000 in year one, \$A45,000 of which supports the salary of the scholarship grant applicant.

Scholarship grants may be funded for two years. **Funds for year two will only be made available if a satisfactory report on the progress of the grant is provided by September 1 each year.** At its discretion, the Research Committee may elect to fund the first year of a grant only and require the applicants to submit a complete project grant application requesting funding for subsequent years.

Chief investigators and associate investigators, who are fellows or trainees of ANZCA or FPM, **MAY NOT** apply for salary support unless they fulfil the eligibility criteria for a scholarship.

Simulation/Education grants

Simulation and education research are high priorities for the college. In order to specifically encourage research in this area and because of the challenges in comparing clinical and laboratory research with research in education, the college established a specific, named Simulation/Education Grant. Applications should be made using the same form as those for project grants, indicating in the appropriate box that it is for a simulation/education grant. Simulation/education grants will be considered as project grants (thus there is no limit to the number that can be supported), but the highest ranked fundable simulation/education grant will be designated the **Simulation/Education grant for that year.**

If the CIA is in doubt as to whether his/her research proposal qualifies for a simulation/education grant please contact the Research and Administration Coordinator.

Scholarship grants are made within the ANZCA project grant scheme. Therefore, researchers in medical simulation and education seeking salary support, as well as general project support, should apply through the ANZCA Project Grant scheme (see above).

D. INSTRUCTIONS TO APPLICANTS FOR COMPLETING FORM

Indicate the type of application being applied for by ticking the appropriate box.

- Project Grant
 Project Grant including Scholarship
 Simulation/Education Grant

1 Scientific project title

The scientific title will be used to identify the application at all times and should accurately describe the nature of the project. Use no more than 120 characters, including spaces. Additional characters will not be recorded.

2 (a) Chief investigators

"Chief investigator A" (CIA) **MUST** be a fellow or registered trainee of ANZCA or FPM. The CIA will be regarded as the contact person for the application and will, in all instances, be assumed to be acting on behalf of, and with the concurrence of, all chief investigators named in this section.

An individual may only be named as a chief investigator or professional research person on a **maximum of TWO active grants and/or applications** in any one year. This maximum includes any grant application which was approved for multi-year funding in previous grant rounds and is still current – a multi-year grant will count as one active grant in each year that it is paid. This provision includes Project Grants, the Simulation/Education Grant and the Academic Enhancement Grant. It does NOT include the Douglas Joseph and Lennard Travers Professorships, which may be considered and awarded in addition to two active grants or applications. If, however, an applicant wishes an unsuccessful professorship application to be considered for a project grant and has indicated this by ticking the box on the professorship application form then when this occurs it will count as one of the two allowed active grants or applications for that round. Fellows and registered trainees must be financial and in good standing with ANZCA or FPM. (Add more rows if necessary).

2 (b) Chief investigator for whom a scholarship is requested

If one of the chief investigators is applying for salary support under the ANZCA scholarship scheme, name that individual here.

2 (c) Associate investigators

Associate investigators may be fellows, trainees, students or professional research personnel, who assist with the research or bring a particular skill (e.g. statistics, assays) to the team. They may or may not be fully conversant with all aspects of the work. Associate investigators do not receive salary support from ANZCA. Add rows to any of the items if necessary.

3 Administering institution

The full name and full address of the institution responsible for administering the grant must appear here (e.g. Royal Prince Alfred Hospital, Missenden Road, Camperdown NSW 2030). While there may be instances where a research project is carried out in more than one location, there can be only one administering institution for each grant.

4 Institution(s) where research will be carried out

The name(s) of the department and name(s) and address(es) of the institution(s) where the proposed research will actually be undertaken is (are) required (e.g. Department of Anaesthesia, Royal Melbourne Hospital VIC 3050). (Add more rows if necessary).

5 Area of research

Specify anaesthesia (01), intensive care medicine (02), pain medicine (03), perioperative medicine (04) or other (05).

6 Keywords

Select up to five keywords or phrases from the list at the end of this guide. If appropriate words are not found in the list, applicants may add their own keywords in this section. The keywords will be used to identify suitable reviewers.

7 Lay description of research

Provide a brief description of the department and/or chief investigator(s), the achievements of the department and/or chief investigator(s), and the proposed research and its significance [suitable for a media release]. No more than one page is allowed. Please provide a lay title.

8 Grant synopsis

This information is used primarily to assign the application for review. This one page synopsis should describe the project and include a description of the aims, significance, context, objectives, methods and likely benefits of the research plan to the research group and the specialty.

Requested non-reviewers: Applicants preferring particular reviewers NOT to be approached to assess their application should attach a letter containing details of up to two non-requested non-reviewers. This letter should be attached to the original application only. These requests will be considered by the ANZCA Research Committee.

9 Research plan

Describe your research project in this section. Do not use more than seven pages in total, including references. Note that the minimum page margin is 2cm and the minimum font size is 10pt. Any additional pages will be removed prior to review.

You **must** use the headings listed below to describe your research.

- 9.1 Aims and significance:** Use this space exclusively to describe the broad aims and potential significance of the research. Hypotheses to be tested **must** be clearly stated.
- 9.2 Background:** Describe the significance of the broad area of research, the objectives of the research and the background including scientific aspects.
- 9.3 Methods:** Include details of the experimental design of the project and statistical methods to be used. Include sample size estimations.
- 9.4 Feasibility:** You must provide evidence that the proposed study can proceed in a timely fashion (i.e. recruitment of participants is assured, instruments have been developed and piloted). If multi-year funding has been requested in the application, the feasibility of the study, specifically in relation to its multi-year timeframe and funding requirements, must be appropriately addressed under this heading in the research plan.
- 9.5 References:** References should be provided within the seven-page count. Do not attach copies of any references. When citing references to other work, include the title of the paper.

Explanatory appendices are not permissible, nor is it appropriate to use such phrases as “refer to last year’s application”.

10 Professional research personnel

Professional research personnel may include nurses, scientists, research assistants and the like. Full-time students, fellows and trainees may not be included as professional research personnel.

Where appropriate, request for professional salaries should be in accordance with the official salary scales (such as NHMRC or nursing scales). Personnel should be named where known. Where the personnel are unknown the required salary should be determined on the basis of the appropriate scale. Requests for new senior research officer positions only must provide a curriculum vitae with the application. Include provision for payroll tax, workers’ compensation insurance, superannuation or other institutional legal liabilities. Nursing awards may also be appropriate for calculating salaries.

Add more rows to any of the tables in this section if necessary and repeat for each named professional research person.

11 Budget items

Please note that applications for more than the maximum amount will be returned.

The budget must be constructed in Australian dollars. The amount available for a project grant, including simulation/education grant is **\$A70,000** (or \$A90,000 if a project grant supports a scholarship) for the first funded year, with second funded year funding capped at **\$A50,000** (or \$A70,000 if a project grant supports a scholarship). Second year funding will only be considered if the application meets the higher ranking criterion as determined by the Research Committee. Therefore, the maximum amount that can be applied for is \$A120,000. Whilst columns are provided for two years, one-year grants are the norm (see above). Please note that institutional infrastructure costs are not paid by the college and should not be included as a budget item.

All items listed in the space provided, are to be classified under these headings:

- 11.1 Personnel:** Chief investigators and associate investigators may not receive salary from project grants, unless they are eligible for scholarship support (see above). Requests for professional research personnel salaries including initial, promotion and renewal requests, should be in accordance with the official NHMRC or MRC designations and salary scales, or appropriate nursing awards. Include provision for payroll tax, workers' compensation insurance, superannuation or other institutional legal liabilities and on-costs.
- 11.2 Equipment:** Equipment requests should not include the type of apparatus normally provided from institutional funds (such as equipment used in the normal course of patient care); requests should cover only those items individually costing over \$A800, which are essential to the project. Where the cost of a specific item of equipment, plus related accessories, is in excess of \$A10,000, a firm written quotation based on current prices, not incorporating any component for customs duty, must be submitted. Applicants should ensure that the institution is prepared to meet all service costs in relation to equipment awarded.
- 11.3 Maintenance:** Enter those items not included within other categories, i.e. such items as equipment costing less than \$A800, consumables (under major headings), printed materials, microfilms, survey or field expenses and computing charges.
- 11.4 Other Items:** Include all other budget items here. Funding for travel or accommodation related to the presentation of study findings will not normally be paid. ANZCA will consider requests for funding for computer programming and preparation, and storage of data, but will not normally provide funds for the hire of computer time on a computer within the applicant's institution. Requests for funds for programming, preparation and data storage or the hire of external computer time must be fully justified. Funds for purchase of computer equipment and hire of computer personnel should be itemised under "Equipment" and "Personnel" respectively.
- 11.5 Justification of budget:** It is important to note that realistic budgetary details for the whole period are provided, as no supplementary requests will be granted. A genuine assessment is therefore required for funding of the grant, particularly if requesting multi-year funding. Amounts requested should reflect the real needs of the project.

12 Chief investigators

The chief investigator(s) is (are) pivotal to the concept, design and conduct of the research, analysis of the data and/or preparation of the manuscripts. The chief investigator(s) is (are) fully conversant with all aspects of the research. Chief investigators **DO NOT** receive salary support, unless they are applying for a scholarship.

Complete item 12 for each named chief investigator on this application. Start each chief investigator on a new page. Add rows to any of the items if necessary.

- 12.1 Contact details:** Please ensure that the details provided are complete and accurate, as this information will be used to communicate with the applicants.

- 12.2 Academic qualifications/awards:** Provide details of academic qualifications including university degrees, specialist college diplomas, research or other awards or honours, the institution or body awarding the qualification and the year it was awarded.
- 12.3 Current appointments:** List all current positions with the location (institution). Any changes during the lifetime of the grant relating require notification to ANZCA.
- 12.4 Previous appointments:** Please list relevant previous positions held.
- 12.5 Anticipated absences during grant period:** Should an investigator be absent during the project grant for a period in excess of two months, specify period of absence and give reason.
- 12.6 Scholarship details:** Include the nature of the scholarship (initial appointment, reappointment or promotion). Indicate whether you have applied to NHMRC. Applicants are strongly encouraged to apply for salary support from NHMRC as well. Briefly describe the arrangements for the scholarship: where the individual will be based, who will supervise or advise on the research, the higher degree and institution and any other proposed outcomes from the research and the weekly time allocation to the research.

13 Research grant support

The information sought on past, present and future support will assist ANZCA in determining the relationship between various projects and the personnel involved in them, including their time commitment. For this reason, applicants should list ALL projects for which their name is recorded as a chief investigator in each category.

In each category, indicate the year of application, ANZCA RegKey, NHMRC application ID etc, title of grant, chief investigators, time commitment of each named investigator to each grant, period of support and funds for each year. In the column headed Publications, please identify separately, by number, each publication listed by a chief investigator which has resulted directly from each project (i.e. CIA-4: the 4th publication in the list of chief investigator A publications). Do not include the same publication more than once; include only original papers published or accepted for publication in refereed journals. Add more rows to each table if necessary.

- 13.1 Completed grants:** Details of past research grant support should encompass all projects or part projects funded over the previous five year period by all sources of grants (not including the year of application), itemising the level of support for each year. Include project grants, program grants, scholarships etc. Exclude any projects which hold a current commitment (e.g. a three year project currently in its second year), to be itemised under 14.2.
- 13.2 Current grants:** Include details of all currently held grants, including those that have been awarded but have not yet commenced.
- 13.3 Requested grants:** Include this application and all other grant requests relating to this program of research, as well as requests related to other research. Please provide full details of ALL funding from any source. Failure to disclose full information will result in the application being removed from any further consideration by ANZCA. If you apply to another funding agency after submitting this application, you must immediately notify ANZCA in writing.

14 Track Record

14.1 Publications of chief investigators

List, and number consecutively, papers published, in press or finally accepted for publication in refereed journals, by any of the chief investigators (CIA, CIB, CIC, CID etc) in the five years prior to the year of application and in the year of application. The listing must indicate titles of papers, sequence of authors as shown in the paper, first and last pages, name, volume and date of journal; for recent papers not yet published, the date of final acceptance by the journal's editor is required. Quality as well as quantity of publications will be considered in the assessment of grant applications. Papers in refereed journals in which the chief investigator was not co-author, but which resulted from previous grants, should be listed at the end of that chief investigator's publications under the title 'non-chief investigator papers' (e.g. papers with scientists or PhDs supported by the grant but in which the chief

investigator was not an author). Documentary evidence of final acceptance by editors must be made available to ANZCA. **Do not include abstracts or papers in preparation or submitted for publication but not yet finally accepted.**

Publications resulting directly from a specific project must be identified in the list of completed or current grants and, where applicable, in progress reports or in summary reports, and should be identified as “CIA -5” or “CIB -2”). Asterisk (*) a maximum of five publications per chief investigator, which are considered to best reflect research contributions to date. Please include the citation index for these 5 papers and the impact factor of the journal in which they were published.

14.2 Other items

The chief investigators may list other items for track record consideration. For participation in multi-centre trials, the chief investigator must be the named principal site investigator. The name of the trial, the chief investigator(s) of the trial and the number of patients enrolled at the time of application must be included. For ongoing study in statistics/epidemiology/research methods, please state the institution, name and duration of the course. Other items may include membership of research ethics committees or grant committees, supervision of research students and the like. A maximum of one page for all investigators combined is permitted.

15 Clearance requirements

The Research Committee strongly encourages investigators to apply for ethics committee approval and submit the approvals to the college by **September 1**. If a grant is awarded, funding will not be released until all relevant clearances for the initial project have been received by ANZCA. ANZCA reserves the right to request full ethics committee submissions and correspondence as part of the granting process. In addition, ANZCA requires that clinical trials are pre-registered with the appropriate agency (e.g. NHMRC).

15.1 Research involving humans

- (i) Approval of the institutional ethics committee should be sought for ALL projects in humans. In the case of audit or routine testing, the ethics committee may not require a formal application, but will provide a covering letter that must be submitted to the College. Human research, in this context, includes research involving any human tissue, no matter what the source, and also includes research in which there is any intervention (physical or psychological) in the normal lives of humans. Projects supported by ANZCA are expected to conform with the general principles outlined in the NHMRC *National statement on ethical conduct in human research 2007 (updated 2018)*. (see NHMRC website)
- (ii) Under the various privacy laws, any form of experimentation involving humans (including epidemiological research) which uses personal information that is obtained from a National or State Department or Agency must be considered by a Human Research Ethics Committee (HREC).
- (iii) All projects involving the administration to humans of drugs, chemical agents or vaccines need to be considered by the relevant HREC to assess the appropriateness of their use. Clearance by the HREC is not only required for projects involving the use of imported substances, but also for projects involving the experimental use of locally produced therapeutic substances. ANZCA funds will not be provided unless appropriate clearance for the use of such substances is given. In the case of multi-centred trials, approval must be obtained from the HREC of each institution involved. In the case of drugs that are not approved for use in Australia, New Zealand, Hong Kong, Malaysia and/or Singapore, approval of the appropriate authority must be obtained before funds can be released.
- (iv) The official letter or statement of approval from the ethics committee must be forwarded to ANZCA no later than **September 1** each year, or before a tax invoice for funds is sent to the College.
- (v) ANZCA should have access, if required, to all information relating to ethical decisions arising from an application and the institutional response to the application. Provisional clearances will not be accepted.

- (vi) Under item 15.4, please summarise all the ethical implications of your research program. Do not use more than one page. Include the issues of privacy, and male-female ratios, and the cultural implications of your research (i.e. as they relate to aboriginal populations). Please refer to the NHMRC *National statement on ethical conduct in human research 2007 (updated 2018)*. Note that it is not sufficient to state that “the NHMRC Statement on Ethical Conduct in Human Research will be observed”. The research plan must include sufficient detail to enable the project to be fully assessed with respect to ethical issues by an independent ethics committee.

15.2 Research involving animals

- (i) Projects supported by ANZCA are expected to conform with the provisions and general principles of the NHMRC *Australian code for the care and use of animals for scientific purposes 8th (Ed) 2013* or the New Zealand equivalent.
- (ii) ANZCA requires a statement from the relevant institutional animal experimentation ethics committee that any project involving animal experimentation has been reviewed and is approved by the Committee as complying with the code of practice. It is the applicant’s responsibility to ensure that a copy of his or her project application is referred to the relevant institutional animal ethics committee; it also his or her responsibility to ensure that the completed approval form is forwarded to ANZCA, no later than **September 1** each year, or before the tax invoice for funds is sent to ANZCA.
- (iii) ANZCA should have access, if required, to all information relating to ethical decisions arising from an application and the institutional response to that application. Please identify the institutional animal ethics committee to which the application has been or will be referred. Provisional clearances will not be accepted.
- (iv) Applicants whose projects involve inbred strains of animals must take action to confirm that the genetic authenticity of the colony has been checked at appropriate intervals.
- (v) Ideally the health status of animals should be known and the colony regularly monitored for pathogens which may influence results in the investigator’s particular area of research.
- (vi) Under item 15.5, please summarise all the ethical implications of your research program. Do not use more than one page. Include the issues related to the care and welfare of animals. Please refer to the NHMRC *Australian code for the care and use of animals for scientific purposes*. Note that it is not sufficient to state that “the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes will be observed”. The research plan must include sufficient detail to enable the project to be fully assessed with respect to ethical issues by an independent animal ethics committee. Applications involving animals must contain adequate information to allow assessment of the ethical implications of experiments, particularly where significant pain and/or distress may be caused, where death is likely to occur, or where experiments in Category 4 are to be carried out.

15.3 Other clearances

15.3.1 Genetic manipulation of organisms: Applicants proposing to undertake research involving genetically modified organisms (GMO) must ensure that all the requirements of the Gene Technology Act 2000 and the Gene Technology Regulations 2014 have been met. Information on the Act and Regulations can be found on the Office of the Gene Technology Regulator website (www.ogtr.gov.au). Applicants should seek advice from their institutional biosafety committee (or equivalent) on the level of authorisation required for any GMO research. Clearances from an institutional biosafety committee (or equivalent) must be forwarded to ANZCA prior to release of grant monies.

15.3.2 Use of carcinogenic or highly toxic chemicals: Applicants whose projects involve the use and disposal of potent carcinogenic or other highly toxic chemicals must adhere to the National Occupational Health and Safety Commission guidelines, National Code of Practice for the Preparation of Material Safety Data Sheets 2nd edition. Further information is available from the Safe Work Australian website or equivalent. Such applicants must seek clearance to be forwarded to ANZCA prior to release of grant monies.

15.6 Conflict of interest

Applicants are NOT required to complete the questionnaire but rather are requested to read and understand the ANZCA Conflict of Interest Policy available at: <http://www.anzca.edu.au/documents/conflict-of-interest-policy.pdf> declare any conflicts, and state how such conflicts will be managed.

16 Progress report on ANZCA grant(s)

A progress report must be provided for each grant being supported by ANZCA at the time of preparing this application and which has listed, as one of the chief investigators, any of the chief investigators of this application. A separate report form should be used for each progress report. It is understood that current projects may not relate to the project proposed in this application. Failure to submit all progress reports may jeopardise its outcome.

At the conclusion of support for each grant, a final report must be submitted to ANZCA. The deadline for this report is within three months of the completion of the project. Each chief investigator on this application, who was listed as a chief investigator on any project that terminated in the December prior to submission of this application, MUST obtain copies of the terminating project's summary report and append it to this application. Failure to comply with this request may jeopardise the outcome of this application. The final report must include a statement of the expenditure charged to the grant. Unused funds may not be expended on other activities and must be returned to the college.

17 Certification by chief investigators, head of department and of institution

The application is invalid without the signature(s) of all the chief investigator(s). Grants will only be considered for support if the head of department/head of research committee certifies that the facilities available are appropriate to meet the needs of the application (e.g. adequately staffed and equipped laboratories/workshops, secretarial assistance, library resources, research/maintenance support including equipment maintenance, animal housing facilities etc).

When applicants are not formally attached to institutions, they should indicate whether they have access to appropriate facilities to undertake the research proposed.

ANZCA accepts as the head of institutions: the registrars of universities, the directors of independent institutes, and the managers/secretaries or medical superintendents of hospitals.

The head of the institution should note that statements of compliance with the NHMRC *Australian code for the care and use of animals for scientific purposes 8th (Ed) 2013* and the NHMRC *National statement on ethical conduct in human research 2007 (updated 2018)* are required to be completed and submitted to ANZCA on request. The head of the institution is also required to certify that the institution has established administrative processes for assuring sound scientific practice in accordance with the *NHMRC Australian code for the responsible conduct of research*.

18 Referees for scholarship applications

Applicants for scholarships should approach individuals to be referees. The applicant should provide each referee with the form and a complete application. The referee must forward their reference to the ANZCA Research Administration Coordinator (research@anzca.edu.au) before the closing date at 5PM AEDT on April 1, 2019.

Attachments

The attachment should be sent by the applicant to two referees if an investigator is applying for a scholarship.

Checklist

Complete checklist and add to original application.

APPENDIX: KEY WORDS AND PHRASES FOR USE IN ANZCA GRANT APPLICATIONS

These key words and phrases are modified from those used by the journal Anesthesiology. If the key word or phrase that describes your work is not listed here, please list in the key word section of your application.

STEMS

ACID-BASE CHEMISTRY

ADDICTION AND DRUG ABUSE

AIRWAY and AIRWAY MANAGEMENT

AMBULATORY CARE

ANAESTHESIA MACHINES and CIRCUITS

ANAESTHETICS, GASES

ANAESTHETICS, INHALATION

ANAESTHETICS, INTRAVENOUS

ANAESTHETICS, LOCAL

Key words/phrases

Alcohol and alcoholism

Airway and ETT assessment

Cervical spine movement

Endotracheal tubes

LMA, ILMA and other supraglottic airways

Laryngeal and pharyngeal function and anatomy

Aspiration

Laryngoscopy, direct

Laryngoscopy, flexible and rigid fiberoptic

Lightwands and other Indirect methods

Lung isolation devices

Tracheostomy and cricothyroidotomy

Anaesthesia ventilators

Circuits and vaporizers

CO₂ absorbants and humidification

Waste gases and scavenging

Nitrous oxide

Xenon

Halothane, enflurane and isoflurane

Desflurane

Sevoflurane

Non-Immobilizers

Other inhalation anaesthetics

Anaesthetic metabolism and degradation

Carbon monoxide

Compound A and fluoride

MAC

Uptake and Distribution

Barbiturates

Benzodiazepines (and antagonists)

Etomidate

Ketamine (and related drugs)

Butyrophenones

Alpha2 agonists (as sedatives)

Propofol

Computer controlled infusions

Opioids (as anaesthetic supplements)

Bupivacaine, lignocaine or mepivacaine

	Ropivacaine
	Encapsulated agents
	Other local anaesthetics
	Cardiotoxicity
	Seizures
AUTONOMIC NERVOUS SYSTEM	Baroreflexes
	Catecholamines
	Heart rate variability
	Microneurography
	Parasympathetic nervous system
	Sympathetic nervous system
AWARENESS and RECALL	Enoxaparin and LMWH
BLOOD COAGULATION	Heparin and protamine
	Hirudin
	Fibrinolytics
	Coagulation testing
	DIC and other coagulopathies
	Platelets and platelet function
	Aminocaproic and tranexamic acid
	Aprotinin
	Recombinant factor VIIa
BLOOD TRANSFUSION, CONSERVATION and SUBSTITUTES	Acute normovolemic hemodilution
	Cell saver and other salvage methods
	Controlled hypotension
	Haemoglobin-based oxygen carriers
	Perfluorocarbons
CANCER and MALIGNANCY	Mutation and mutagenesis
CARDIOVASCULAR FUNCTION, DISEASE AND MANAGEMENT	Cardiac electrophysiology and conduction
	Cardiac rhythm and dysrhythmias
	Cardiac smooth muscle and myocyte function (in vitro)
	Cardiopulmonary bypass
	Circulatory arrest
	Circulatory physiology and hemodynamics
	Congenital heart disease and surgery
	Coronary circulation, myocardial ischemia and infarction
	Cardiac revascularization surgery (CABG etc)
	Myocardial preconditioning and protection
	Reperfusion injury
	Valvular heart disease and surgery
	Ventricular function
	Hypertension
	Pacing, pacemakers and defibrillators
CARDIOVASCULAR DRUGS	ACE inhibitors
	Alpha2 agonists (CV Actions)

	<ul style="list-style-type: none"> Beta-Adrenergic blockers Beta-Agonists Calcium channel blockers Other antiarrhythmics Norepinephrine and epinephrine (vasopressors) Dopamine Dobutamine Fenoldepam Phosphodiesterase inhibitors Amrinone and milrinone Nitroprusside and nitroglycerin Other vasopressors Vasopressin Statins
CELL BIOLOGY AND PHYSIOLOGY	<ul style="list-style-type: none"> Apoptosis ATP and electron transport Calcium and calcium signaling Calcium binding proteins Gene expression Mitochondria
CHEMISTRY, BIOPHYSICS AND PHYSICS COMPLICATIONS	<ul style="list-style-type: none"> Drug related Equipment related Procedure related Compartment syndromes Other
CRITICAL CARE	<ul style="list-style-type: none"> Burns Trauma care
DERMATOLOGY	
ECONOMICS, OR MANAGEMENT and MANPOWER EDUCATION	<ul style="list-style-type: none"> Trainee evaluation Simulators
EMBOLI and EMBOLIC DISORDERS	<ul style="list-style-type: none"> Amniotic fluid emboli Fat and particulate emboli Pulmonary thromboembolism Venous and arterial gas emboli
ENDOCRINOLOGY	<ul style="list-style-type: none"> Diabetes mellitus and insulin Oestrogen Pheochromocytoma Renin and angiotensin Atrial and brain natriuretic peptides
EPIDURAL and SPINAL	<ul style="list-style-type: none"> Dural-puncture headache and blood patch Neurologic symptoms and injury Balance, posture and position sense

ETHICS	Brain death and organ harvest Do Not Resuscitate orders Human studies and consent
EYE	Eye injuries and blindness Eye surgery Intraocular pressure
FLUIDS, ELECTROLYTES and PLASMA SUBSTITUTES	Hetastarch and pentastarch Hypertonic saline Osmolality and oncotic pressure Serum sodium, potassium and other electrolytes Lipid and intralipid
GASTROINTESTINAL PHYSIOLOGY and PATHOPHYSIOLOGY	Gastric reflux and emptying Intestinal motility Intestinal permeability Splanchnic circulation
GENDER GENETICS and GENETIC DISORDERS	Sickle cell disease Genetic testing Gene therapy
GERIATRICS HISTORY and HUMOR IMAGING	CT scanning Magnetic Resonance Imaging and fMRI PET scanning Ultrasound Xray
IMMUNOLOGY, INFLAMMATION and INFECTION	Allergy and snaphylaxis Latex allergy Histamine and antihistamines Steroid therapy (systemic) Antibiotics Systemic inflammatory response/disease Cytokines and interleukins Tumour Necrosis Factor Endotoxin and lipopolysaccharides Free radicals and scavengers Leukocytes, lymphocytes and macrophages Phagocytosis Wound infection Infection control (hand washing, antiseptics etc)
IONS AND ION CHANNELS	Calcium and calcium channels Potassium and potassium channels Sodium and sodium channels Ion transport
KIDNEY and BLADDER PATHOPHYSIOLOGY	Bladder function and urinary retention

Renal failure and dialysis

LIVER PHYSIOLOGY and PATHOPHYSIOLOGY

Liver blood flow
 Liver function tests

MALIGNANT HYPERTHERMIA

Diagnostic testing
 Genetics and genotyping

METABOLISM and NUTRITION

Glucose and carbohydrate metabolism
 Whole body metabolic rate
 Obesity
 Protein metabolism

MONITORING (CARDIORESPIRATORY)

Arterial catheters and pressure measurement
 Blood volume, systemic
 Systolic pressure variation
 Cardiac output measurement
 Central venous catheterization
 Doppler, other
 Doppler, precordial
 Echocardiography, transoesophageal
 Echocardiography, other
 Electrocardiography
 Expired gas analysis
 Gastric tonometry
 Oximetry, pulse
 Oximetry, mixed venous
 Oximetry, other
 Pulmonary artery catheterization

MONITORING (CNS)

BIS and similar techniques
 Electroencephalography (EEG)
 Evoked potentials, auditory
 Evoked potentials, motor
 Evoked potentials, other
 Evoked potentials, somatosensory
 Oximetry, jugular venous
 Oximetry, transcranial
 Transcranial Doppler
 Depth of Anaesthesia Assessment

NAUSEA and VOMITING

Antiemetics

NERVE BLOCKS

Brachial and cervical plexus blocks
 Celiac plexus block
 Lower extremity blocks
 Intravenous regional anaesthesia
 Other regional techniques
 Nerve localization methods
 Nerve injury and other complications
 Neostigmine and anticholinesterases

	<ul style="list-style-type: none"> Neuromuscular monitoring Nondepolarizing agents Succinylcholine Myaesthesia Gravis
NEUROPHYSIOLOGY, BRAIN	<ul style="list-style-type: none"> Blood brain barrier Cerebral blood flow and volume Cerebral oedema and intracranial hypertension Cerebral ischemia and anoxia Cerebral metabolism Cerebral protection and preconditioning Clinical neuroanaesthesia Clinical neurology and neurologic examination Head injury Hippocampus and hippocampal electrophysiology Intracranial pressure and intracranial hypertension Neuronal electrophysiology, other
NEUROPHYSIOLOGY, SPINAL CORD	<ul style="list-style-type: none"> Dorsal root ganglia Spinal cord electrophysiology Spinal cord injury Spinal cord ischemia Spinal cord anatomy Spinal cord protection and preconditioning
NEUROPHYSIOLOGY, PERIPHERAL NERVE	<ul style="list-style-type: none"> Peripheral nerve injuries Growth factors Nerve conduction and EMG Peripheral nerve electrophysiology
NEUROTRANSMISSION, TRANSMITTERS AND RECEPTORS	<ul style="list-style-type: none"> Acetylcholine and receptors Adenosine and receptors Adrenergic agents and receptors Cannabis and cannabinoid Receptors Capsaicin and thermal receptors Dopamine and receptors GABA and receptors Glutamate and receptors Glycine and receptors Neurokinins and receptors Nitric oxide and nitric oxide Synthase Opioids and opioid receptors Serotonin and serotonergic receptors Neurotransmitter release and reuptake
NEUROTRANSMISSION and SIGNAL TRANSDUCTION	<ul style="list-style-type: none"> G-proteins cAMP and cGMP Protein kinases
OBSTETRICAL ANESTHESIA	<ul style="list-style-type: none"> Caesarean section Eclampsia and preeclampsia

	Labour and delivery Uterine and placental function Uterine smooth muscle
OXYGEN and OXYGEN TRANSPORT	Hypoxia Hemodilution (physiology) Tissue oxygen tension (PtO ₂) Hyperbaric oxygen
PAIN MANAGEMENT, CLINICAL	Acupuncture and accupressure Chronic pain Epidural and other steroid injections Neuropathic pain and CRP Stellate ganglion blocks Lumbar sympathectomy Pain assessment techniques Patient controlled analgesia Postoperative pain Headache (NOT PLPH) Herpes zoster Intraarticular analgesia Intrapleural and intraperitoneal local anaesthetics Phantom limb pain Preemptive analgesia (clinical) TENS and related methods Spinal cord stimulation Epiduroscopy Radiofrequency lesions and neurolysis
PAIN-RELATED PHARMACOLOGY	Alpha 2 Agonists (analgesics) Aspirin and Acetaminophen Baclofen COX2 antagonists Gabapentin Neostigmine NMDA antagonists NSAIDs Opioids Opioid antagonists Opioid tolerance Tramadol Nitric oxide
PAIN PHYSIOLOGY, EXPERIMENTAL	Incisional pain Neuropathic pain Inflammatory pain Pain assessment techniques Pain mechanisms, central Pain mechanisms, peripheral Pain mechanisms, spinal Pain models

visceral pain

PATIENT SAFETY and MEDICOLEGAL ISSUES

Closed claims studies
 Electrical and fire safety
 Medicolegal matters

PAEDIATRIC ANESTHESIA and PAEDIATRICS

Neonatology

PHARMACOKINETICS and PHARMACODYNAMICS

Pharmacogenetics

PHARMACOLOGY (GENERAL)

Chronopharmacology/Chronobiology
 Drug interactions
 Drug metabolism
 Cytochromes P450
 Drug toxicity
 Liposomes and microcapsule delivery systems
 Osmotic pumps
 Stereoisomers
 Transcutaneous delivery systems
 Transmucosal delivery systems

PHYSICIAN SAFETY

POSITIONING

POSTOPERATIVE CARE

PREOPERATIVE ASSESSMENT and CARE

PROSTAGLANDINS and RELATED COMPOUNDS

PSYCHOLOGY, PSYCHIATRY and BEHAVIOR

Antidepressants
 Anxiety and anxiolysis
 Psychologic, psychometric and behavioural
 Testing
 Electroconvulsive Therapy (ECT)

RESPIRATORY DISORDERS and MANAGEMENT

ARDS and lung injury
 Aspiration pneumonia
 Asthma and bronchospasm
 Barotrauma
 COPD
 Extracorporeal membrane oxygenation
 High frequency ventilation
 Mechanical ventilation
 Nitric oxide inhalation
 Pneumonia and lung infections
 PEEP and CPAP
 Pulmonary oedema
 Pulmonary function testing
 Smoking

RESPIRATORY PHYSIOLOGY

Alveolar macrophage function
 Control of respiration
 Gas exchange
 Pulmonary blood flow
 Respiratory mechanics
 Surfactant
 Tracheal and bronchial smooth muscle
 Ventilation-perfusion matching

RISK, OUTCOME and QUALITY MANAGEMENT

Patient safety and satisfaction
 Quality assurance and management
 Morbidity and mortality
 Perioperative risk factors
 Automated record keeping

**SEIZURES and ANTICONVULSANTS
 SHOCK AND RESUSCITATION**

Cardiac arrest and CPR
 Sepsis and septic shock
 Haemorrhagic and hypovolemic shock

**SKELETAL MUSCLE
 SLEEP and SLEEP DISORDERS**

Circadian rhythm
 Sleep apnoea
 Sleep deprivation

STUDY DESIGN AND TECHNIQUES, LABORATORY

Autoradiography
 Brain slices
 Histopathology and histochemistry
 Cultured cells and tissues
 Laser Doppler Flowmetry
 Microdialysis
 Patch clamping
 PCR
 Receptor binding
 Recombinant methods
 Transgenic and knockout animals
 Isobolographic analysis
 Analytic chemistry (chromatography etc)
 Molecular modeling

STUDY DESIGN AND TECHNIQUES, CLINICAL

Clinical trial
 Epidemiology
 Mathematical modeling
 Metaanalysis
 Statistics
 Survey

SURGERY, MISCELLANEOUS

Laparoscopy
 Neurosurgery
 Oral surgery
 Orthopaedic surgery
 Joint Replacement surgery
 Otolaryngology
 Plastic surgery
 Aortic aneurysm (abdominal and thoracic)
 Carotid endarterectomy
 Thoracic anaesthesia and surgery
 Vascular surgery
 Other surgical procedures

TEMPERATURE REGULATION and MANAGEMENT

Hypothermia
 Hyperthermia and fever

TRANSPLANTATION

Heart transplantation
Liver transplantation
Lung transplantation
Immunosuppressants

VASCULAR PHYSIOLOGY

Rheology and viscosity
Endothelium
Endothelin
Leukocyte adhesion
Nitric oxide, nitric oxide synthase and EDRF
Selectins
Vascular smooth muscle
Vascular growth factors
Vascular electrophysiology
Microcirculation