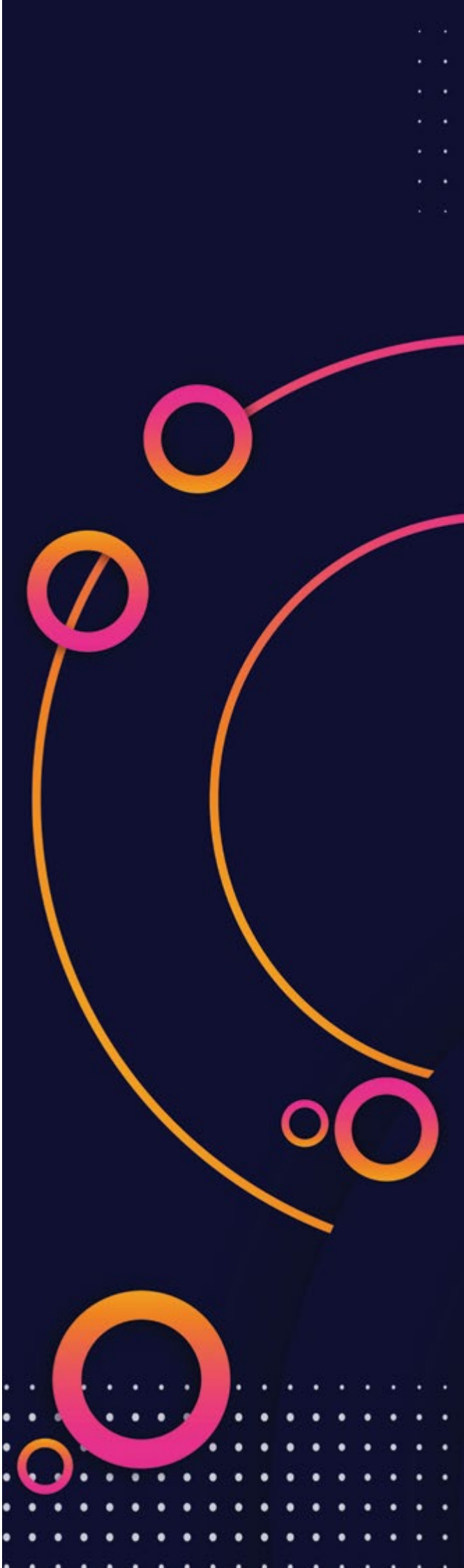
Australian Government

National Health and Medical Research Council

Good Institutional Practice Guide

A guide for promoting an institutional research culture that supports the conduct of high-quality research

Consultation Draft (2024)



NHMRC

BUILDING A HEALTHY AUSTRALIA

Contents

Snapshot

Purpose: For all institutional and research leaders, this Guide will help you foster a culture in your institution to support your researchers to produce high-quality research. You can use sections of this document as needed to guide your graded implementation of any changes.

Values that support an inclusive and open research culture conducive to high quality research:

- Care and collegiality
- Collaboration
- Equity, diversity, inclusion and respect for others
- Integrity and ethics
- Intellectual freedom and autonomy
- Openness and transparency

Elements. Improve your institutional research culture by making positive changes in the following areas:

- Modelling and leadership
- Institutional resources
- Education and training
- Rewards and recognition
- Reporting and addressing research quality issues
- Communication
- Monitoring, evaluation and reporting

Practical guidance for each element about how to identify and implement necessary improvements:

Graded implementation

- Make it **possible**
- Make it **easy**
- Make it **normative**
- Make it **rewarding**
- Make it **required**

Case studies

Scenarios

Desired outcomes

Self-reflection questions

Intended outcomes:

- Institutional research culture that is open, honest, supportive and respectful
- Enhanced quality of NHMRC-funded research so as to realise the maximum value from research investment and public funds
- Recognition and reward of initiatives that improve research quality

Definitions

For the purposes of this Guide, terms are defined in Table 1.

Table 1. Definitions

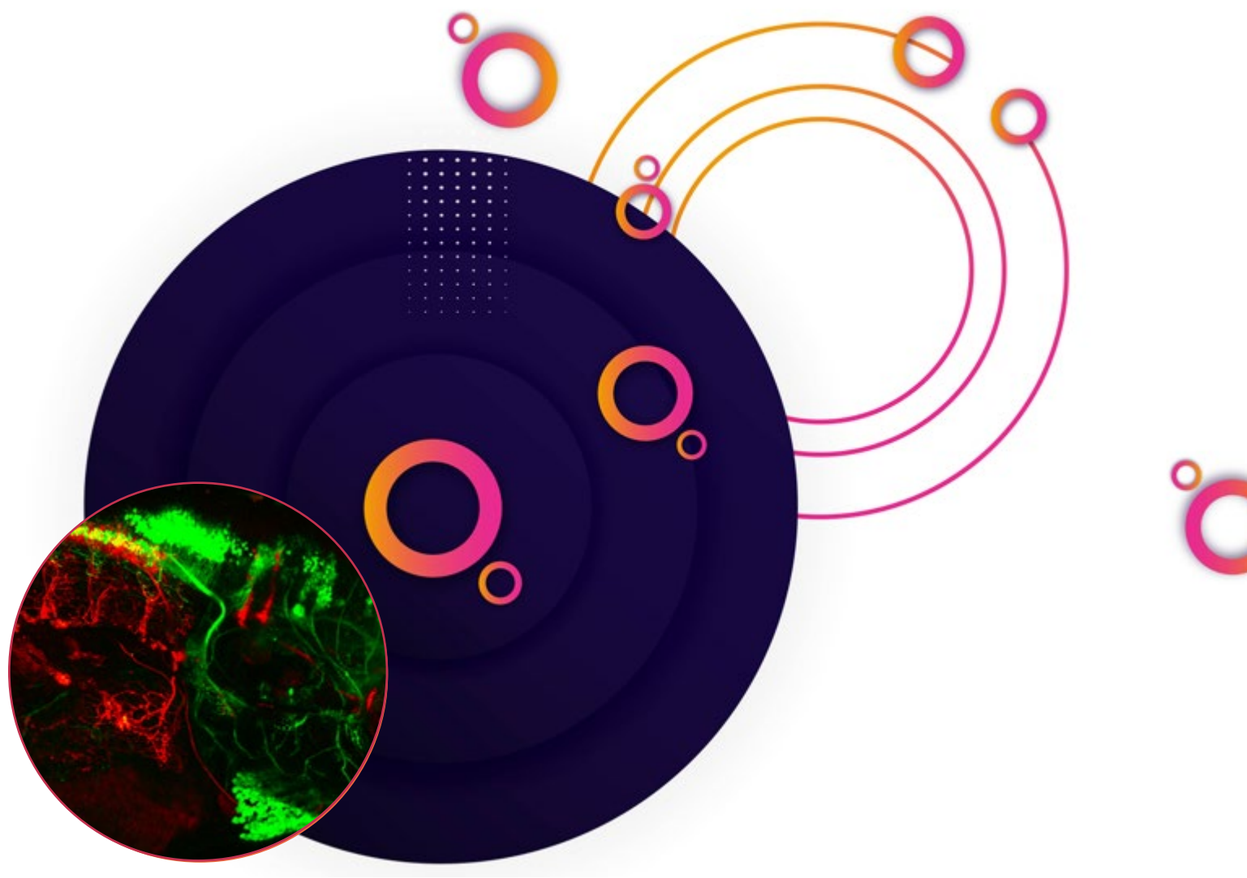
Term	Definition
Good research practices	Behaviours a researcher can engage in at all stages of the research cycle to improve the quality and trustworthiness of the research.[1] Examples include, but are not limited to, pre-registration of studies, reducing investigator bias, justifying sample size, using appropriate statistical methods, replication, using reporting guidelines, transparency, reproducibility, and responsible and fair peer review.[2,3,4,5]
Institution	An institution that administers NHMRC funds and includes universities, hospitals, health services and medical research institutes that meet defined research governance requirements.[6]
Institutional leader	Research leaders and senior administrators within the institution.
Peer generative power	Power generated by cohorts of Aboriginal and Torres Strait Islander researchers emerging from informal peer networks is largely responsible for driving the growth and successes of the Indigenous researcher workforce.[7]
Relative to opportunity	Assessment of achievements that take into account the impact of personal circumstances on a person's productivity, their ability to participate in certain types of activities, and the consistency of activities or output over the period of consideration.[8]
Research community	Those involved with the conduct of health and medical research.
Research culture	The behaviours, attitudes, values, expectations and norms of research communities.
Research Quality Advisor	A person employed by an institution to provide advice to all institutional staff and students about practices that support the conduct of high quality research and a positive research culture within the institution.
Research quality issues	Behaviours that have an adverse effect on the quality and trustworthiness of the research and that are not misconduct, as defined by the *Australian Code for Responsible Conduct of Research*.[9] Examples include (but are not limited to) proposing research questions that are easy to answer rather than needed, using inappropriate statistical methods and selective reporting of results.

Abbreviations

Abbreviations used in this Guide are listed in Table 2.

Table 2. Abbreviations

Abbreviation	Meaning
ARRIVE	Animal Research: Reporting of In Vivo Experiments
CARE	Collective benefit, Authority to control, Responsibility and Ethics (Principles for Indigenous Data Governance)
CoARA	Coalition for Advancing Research Assessment
DORA	Declaration on Research Assessment
F.A.I.R	Findable, Accessible, Interoperable and Reusable
NHMRC	National Health and Medical Research Council



Introduction

Research culture and research quality

Research culture encompasses the behaviours, attitudes, values, expectations and norms of research communities.[10,11]

As well as influencing the way that science is governed, funded, performed and communicated, research culture also affects researchers' careers and the quality of research.[10,11] Researchers are more likely to thrive and produce high-quality research when their institution has a positive working environment and culture.

Examination of the links between culture, policies and processes that govern research systems and research practices are the subject of numerous international initiatives and activities in the United Kingdom, Europe, and the United States of America (see Section 4.1). Recent surveys of the Australian research sector highlighted concerns about education and training in good research practices, research integrity, mentorship, unhealthy competition, publishing pressures, promotion assessment processes, funding/costs, job insecurity, and questionable research practices.[12,13,14] These concerns are not unique to the Australian situation.[15,16,17,18] Responses to these numerous challenges require reconsideration of research policies and practices, and the behaviours and actions that they reward and incentivise. The outcomes from the 2019 *NHMRC survey of research culture in Australian NHMRC-funded institutions* also highlighted that institutional leaders can make an impact on research culture and quality by promoting an environment where high-quality research is the norm.[12]

Background

The National Health and Medical Research Council (NHMRC) is Australia's leading funding agency for health and medical research. Promoting the highest quality of NHMRC-funded research is a priority for the agency and aligns with NHMRC's strategy for health and medical research. High-quality research that is rigorous, transparent and reproducible:

- contributes to scientific progress
- is essential for the translation of research outcomes into practical and clinical applications and evidence-based policy
- delivers the highest possible value from research investment and public funds
- respects research participants, the wider community, animals and the environment
- promotes community trust in scientific findings.

NHMRC's Research Quality Strategy (the Strategy) was developed with advice from NHMRC's Research Quality Steering Committee, which advises NHMRC about enhancing the quality of NHMRC-funded research.[19,20] The Strategy aims to promote the highest quality and value of NHMRC-funded research. One of its objectives is the provision of guidance for NHMRC-funded institutions about good institutional practice for promoting a research culture that supports the conduct of high-quality research.

Australia's framework for responsible and ethical research conduct is underpinned by three national standards developed by NHMRC and its co-authors, the Australian Research Council and Universities Australia:

- *Australian Code for the Responsible Conduct of Research, 2018*[9]
- *National Statement on ethical conduct in human research, 2023*[21]
- *Australian code for the care and use of animals for scientific purposes, 2013 (updated 2021).*[22] (This code is also co-authored by the Commonwealth Scientific and Industrial Research Organisation.)

Together these three standards provide guidance on responsible and ethical research conduct across all research disciplines. The overarching document is the *Australian Code for the Responsible Conduct of Research, 2018*, which establishes a framework for responsible research conduct and a foundation for high-quality research across all disciplines. Human Research Ethics Committees and Animal Ethics Committees play an integral role in ensuring the quality and ethical conduct of NHMRC-funded research.

Purpose of this Guide

This Guide provides guidance about promoting an institutional culture that supports the conduct of high-quality research. It describes elements of research culture conducive to creating a positive working environment in which researchers are more likely to thrive and produce high-quality research. It also provides guidance for institutions on how to identify areas where improvement is needed and practical examples of how improvements can be implemented.

As institutions vary in size, maturity, resources and organisational structure, so too does the research culture within and between institutions. Many institutions already have processes and initiatives in place to support the conduct of high-quality research and to continually improve their research culture. Given that approaches may vary between institutions, the information in this Guide is presented in a way that allows for flexibility in its application.

The intended outcomes from the Guide are:

- The culture in institutions in receipt of NHMRC-funding is open, honest, supportive and respectful.
- The quality of NHMRC-funded research is enhanced so as to realise the maximum value from the research investment and public funds.
- Initiatives that improve research quality are recognised and rewarded.

Scope

This Guide is focused on how institutional leaders can promote and facilitate the conduct of high-quality research. It is not intended to provide guidance about specific research practices. It is also not intended to provide guidance on addressing deliberate or intentional research misconduct. Research misconduct is a matter that NHMRC takes very seriously given its potential impact and has a framework of policies and guidelines in place to deal with it.[23]

Intended audience

This Guide is intended for use by those involved with the conduct of NHMRC-funded research including:

- research leaders/senior administrators at institutions and within research groups
- researchers
- undergraduate and postgraduate research students
- staff involved with research ethics (for example, human research ethics committees and animal ethics committees)
- staff involved with research governance
- research administration staff
- research support staff (for example, librarians, information technology professionals, data stewards, core facility staff).

Those involved with the conduct of research that is not funded by NHMRC should also find this Guide useful.

Structure of this Guide

- Section 1 describes values that underpin a good institutional research culture and support the conduct of high-quality research.
- Section 2 presents information about how institutional leaders can approach implementing the recommendations in this Guide to achieve improvements in institutional research culture.
- Section 3 outlines elements of institutional research culture that influence the research working environment and provides practical examples of how institutional leaders can gradually implement improvements.
- Section 4 provides information about relevant international initiatives, useful resources and references.

1 Values

The values that underpin an institution's research culture will guide and motivate attitudes and actions and influence how research is governed and performed. This section describes values that support a positive, inclusive and open research culture that is conducive to the conduct of high-quality research.

1.1 Care and collegiality

Members of the research community[a] should care for research participants, colleagues and themselves, and take responsibility for establishing and maintaining collegiality. Valuing care and collegiality means respecting, recognising and valuing the network of relationships in which research takes place, and the people and other animals in research situations. It includes stewardship of resources, prioritising sustainability of research career paths, and minimising environmental impact.

1.2 Collaboration

When working in collaboration with others, researchers are more likely to debate new ideas and incorporate multiple perspectives into their work, while increasing the transparency and openness of research processes. Members of the research community should embrace collaboration within and between academic disciplines and institutions, as well as with society and relevant education, policy and industry sectors.

1.3 Equity, diversity, inclusion and respect for others

Respect for others is a fundamental ethical value. Equity, diversity and inclusion can build a strong research workforce with the experience and skills to serve the diverse Australian community. Individuals should respect others. Institutional leaders should strive to create and maintain a supportive and respectful research culture. This includes ensuring research environments are free from bullying and harassment for people at all career stages; recognising the rights and heritage of colleagues and research participants; prioritising cultural safety, responsiveness and humility; and recognising, valuing and investing in Aboriginal and Torres Strait Islander researchers as being Aboriginal and/or Torres Strait Islander. Members of the research community should make research environments accessible and accommodating to all, including people of different ability, ancestry, faith, sex, gender, sexual orientation, and socioeconomic status.

[a] Members of the research community' refers to all those involved with the conduct of health and medical research (see 'Intended Audience' in the Introduction).

1.4 Integrity and ethics

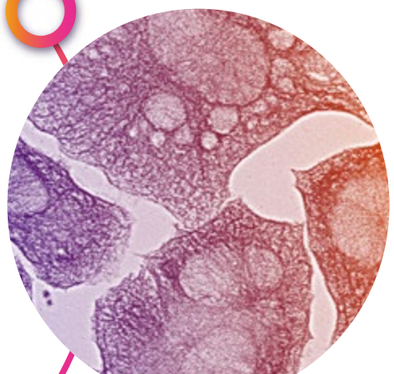
Members of the research community should uphold the highest standards of research ethics and integrity and be committed to the responsible and ethical conduct of research. Behaving ethically and with integrity is more than simply doing the right thing. It involves acting in the right spirit, out of an abiding respect and concern for one's fellow creatures. It also involves actions to maintain and improve reliability, honesty, respect, and accountability in the research domain. Integrity and ethics should '*permeate the way those engaged in … research approach all that they do in their research*'.[21]

1.5 Intellectual freedom and autonomy

Researchers should be free to explore and express ideas and follow activities of their choice in accordance with good research practices, and consistent with their expertise and within appropriate professional and disciplinary constraints. Open scientific debate and critique should be encouraged as it can serve to strengthen the research effort. Individuals should exercise this freedom and autonomy in a way that upholds the other values outlined in this section.

1.6 Openness and transparency

Members of the research community should ensure that, wherever possible, all aspects of research are accessible and shared openly and transparently.[24] Openness and transparency makes research processes more efficient, productive and reliable and increases the public's trust in research processes and findings. In addition, it helps to address global and local inequalities by extending the reach of the research benefit and assisting under-resourced researchers.



2 Approaches: Implementing change to improve institutional research culture

There are many and varied approaches that institutions can take to bring about cultural change.

This section describes the following elements of institutional research culture and practice that influence the research working environment:

- Modelling and leadership
- Reporting and addressing research quality issues
- Institutional resources to support the conduct of high-quality research
- Communication
- Education and training about good research practices
- Monitoring, evaluation and reporting
- Rewards and recognition

Depending upon an institution's circumstances, leaders can choose to implement some or all of the changes proposed under each element. It is hoped that these changes will bring about a positive, inclusive and open research culture in which researchers will feel inspired to conduct high-quality research.

An example of how institutional leaders can approach identifying areas for improvement, and designing and implementing a plan for culture change, is outlined in Figure 1

Model for designing and implementing a plan for culture change within an institution

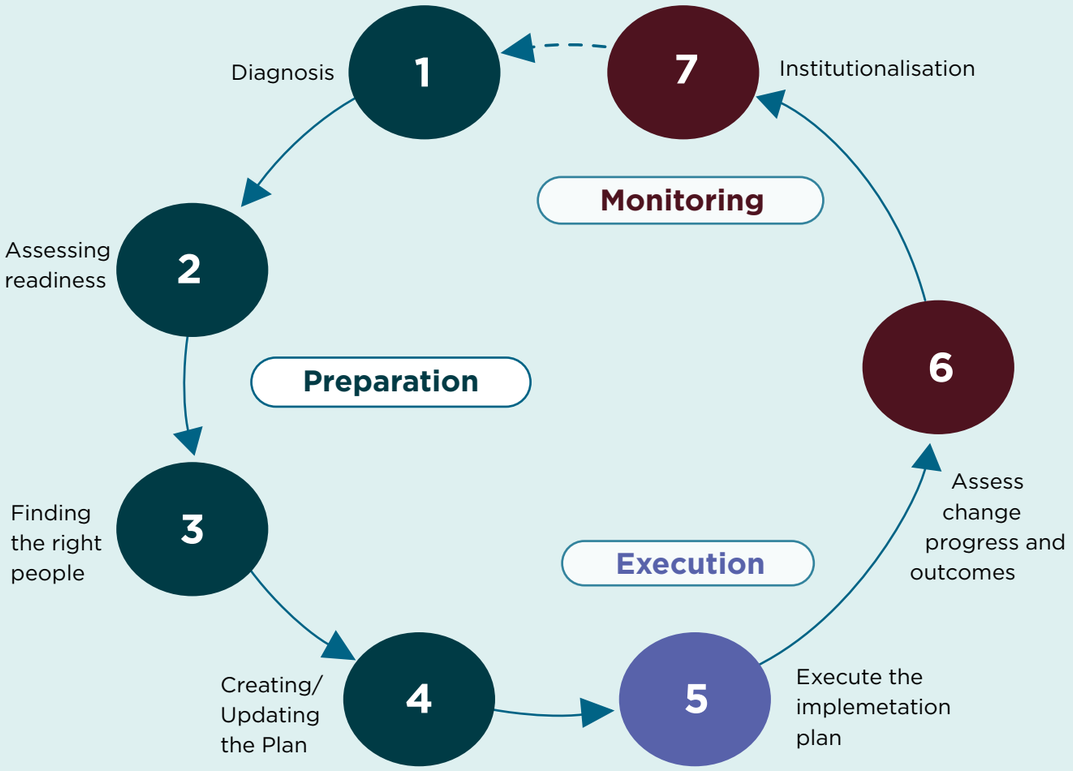
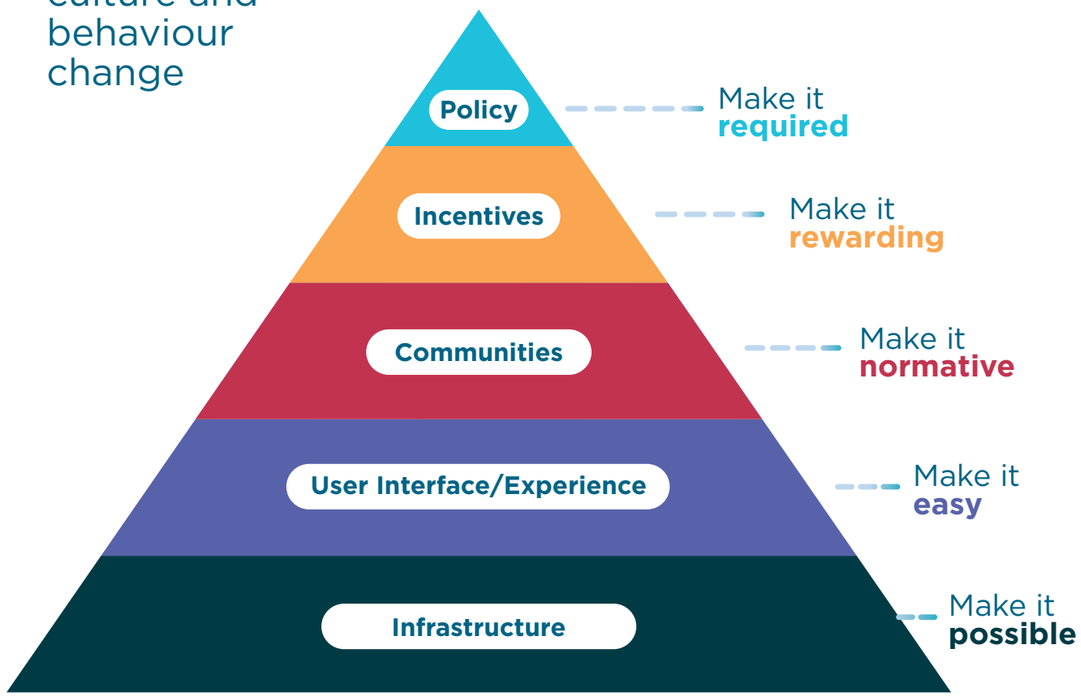


Figure 1. Model for designing and implementing a plan for culture change within an institution (adapted from Serge et al[25])

The principal framework underlying advice about how institutions can gradually and progressively implement improvements is outlined in Figure 2.[26] This 'Strategy for culture and behaviour change' describes five levels of action that are progressive, reflecting that successful implementation of higher levels can depend on foundational success at lower levels. Basic infrastructure including tools and skills make change in research culture possible. Ensuring that this infrastructure is user-friendly makes it easy for members of the research community to adopt new practices. Once new practice has spread to and is recommended by (a large part of) a research community, its adoption may be considered normative. As a further step in advancing the uptake of new practice, incentives may be introduced that make the adoption of the practice rewarding. Finally, the implementation of new practice may be made required by policies.[27]

Strategy for culture and behaviour change



The diffusion of innovation

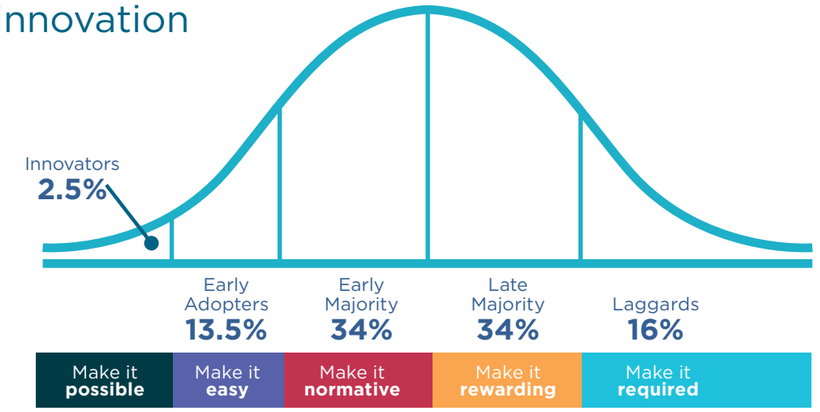


Figure 2. Centre for Open Science: Strategy for culture and behaviour change[26]

SAFE WORKING ENVIRONMENT

Institutions must create a culturally safe working environment for Aboriginal and Torres Strait Islander researchers where they can thrive and produce high quality research.[28]

Institutional leaders can help Aboriginal and Torres Strait Islander researchers strengthen their research capability and reduce institutional racism by creating a working environment which understands cultural differences and needs, and promotes cultural safety. In such an environment everyone understands and welcomes the cultural strengths of Aboriginal and Torres Strait Islander researchers and recognises that they are an asset to the institution. The working environment should be underpinned by collaboration and unity, rather than by competition which fragments teams: relationships should be valued.

Institutional leaders can take the following actions to implement a working environment which is culturally safe and welcoming to Aboriginal and Torres Strait Islander researchers:

- establish cultural and symbolic processes and policies throughout the year, not just during celebration periods (for example, by holding smoking ceremonies and by flying the Aboriginal and Torres Strait Islander flag)
- provide cultural mentoring and supervisors who can help navigate cultural interfaces
- provide a space for Aboriginal and Torres Strait Islander discussion and business while encouraging the fusion of traditional knowledge practices with other knowledge practices
- recognise the 'differences' of Aboriginal and Torres Strait Islander research (for example, that developing and maintaining relationships are important parts of the culture)
- foster collaboration among all researchers by holding workshops, seminars, masterclasses, and other less structured forums where people can interact and grow together.

When Aboriginal and Torres Strait Islander researchers feel welcome, appreciated and safe in the institutional environment, they will be more likely to thrive and produce high quality research.

CASE STUDY: TWO DIFFERENT APPROACHES TO ACHIEVING INSTITUTIONAL CULTURAL CHANGE

The **University of Glasgow** recognises that if they want to attract researchers to come and do high quality research and stay for the longer term, then they must create a positive research culture.[29] Hence they have a team of people focused on creating a positive research culture by promoting collegiality, career development, research recognition, open research and research integrity. The objectives, activities and measures of progress are comprehensively described in their *Institutional strategic priorities for research culture 2020–2025* plan.[30]

To date, they have:

- established a Research Culture Commons which people can join and contribute to culture change and shared goals
- undertaken research culture surveys to understand where they are making progress and where there is still work to be done
- established annual awards to recognise and celebrate supervisors, principal investigators and research professional colleagues who contribute to a positive research environment
- created a Talent Lab with six diverse initiatives focusing on developing leadership in research and researchers as leaders.

The **Stanford Program on Research Rigor and Reproducibility** (SPORR) is committed to supporting a culture of research rigor and reproducibility (R&R) so that Stanford researchers can produce high quality research and meet the requirements of funding agencies, journals, private sector partners and others.[31] Run by Stanford Medicine, SPORR has a variety of initiatives in place and others in the pipeline, which are aimed at faculty, staff, graduate and postgraduate students and fellows. Their initiatives include:

- core R&R courses such as 'The practice of reproducible research' and 'Foundations of statistics and reproducible research'
- ReproducbiliTea, which is an international community of journal clubs that advance open science and improve academic research culture
- monthly R&R Grand Rounds; a consultation and feedback service on data sharing and data management plans
- free consultations for research teams writing training grants.

Early-career researchers can obtain help with study-design, analysis and interpretation from a network of like-minded experts across Stanford Medicine. It is intended that Stanford Medicine researchers and staff will be rewarded for their R&R accomplishments. They are also planning to incorporate R&R monitoring and accountability, incentives, and cultural change into the everyday research workflow.

3 Elements of institutional research culture that support high-quality research

This section builds on the values outlined in Section 1 that support positive, inclusive and open research cultures. It identifies elements of an institution's culture that contribute to the research working environment and provides practical guidance about how institutional leaders can translate and embed the values into behaviours, attitudes, expectations and norms of the institution's research community. Practical information is provided to assist institutional leaders to determine where improvements are needed, with suggested approaches for achieving continuous improvement. Sample self-reflection questions are provided as prompts to help institutional leaders determine their stage of implementation. Case studies and scenarios outline examples of how some institutions have achieved positive cultural change. Relevant results from the 2019 NHMRC survey of research culture in Australian NHMRC-funded institutions are highlighted.

It needs to be acknowledged that Aboriginal and Torres Strait Islander researchers generally enter the field of academic research with substantial knowledge gained through their work in the community and in industry, with extensive expertise and experience; and yet, their skills and contributions are often unrecognised, undervalued, not remunerated, or marginalized in other ways. It is vitally important that institutional leaders work to remedy this so that Aboriginal and Torres Strait Islander researchers are free to thrive and excel in the research environment. Their success is critical to shaping health research agendas and ensuring that research is better aligned with Aboriginal and Torres Strait Islander community needs.[32]

3.1 Modelling and leadership

3.1.1 Introduction

Traditionally, health and medical researchers who oversee a large team of staff, have many PhD students, and a continuous flow of publications in high impact journals, are perceived as strong and successful research leaders. This guide seeks to define a different version of what makes a good leader in health and medical research: one who promotes a vision for the future that is positive and value-based, promotes good research practice, open science, reflection and collegiality.

When a leader exemplifies and reinforces the institution's core values, they help to create a culture that reflects these values and inspires staff to behave and act accordingly. A good leader recognises the contributions and achievements of all members of their team, in particular, their diverse outputs, practices and activities that maximise the quality and rigour of research. A good leader creates a supportive and encouraging environment where everyone can speak freely about the data, including its strengths and weaknesses; be honest and open about their decisions and mistakes; practices humility and is open to alternative views; ensures the equitable distribution of resources; and discusses common research quality issues in team meetings. Effective leaders also need to facilitate succession planning by supporting the development of leadership skills in junior researchers, and by actively seeking to develop and broaden the team's talent and skills. When such attributes and behaviours are reflected in a team's leadership, the research environment is more likely to foster a culture in which everyone feels supported and appreciated and where everyone strives to conduct high-quality research.

Supervision of early career researchers, Higher Degree by Research (HDR) candidates, undergraduate students and other research trainees plays a critical role in the responsible conduct of research and comes with many and varied responsibilities. The supervisory role incorporates oversight of all relevant stages of the research process from conceptualisation and planning through to dissemination of findings and as appropriate, publication and follow-up activities. Institutional leaders should actively promote supervisory best practice, acknowledging and, as appropriate, rewarding genuine excellence in supervision.[33] Under the *Australian Code for the Responsible Conduct of Research*[9], institutions have the responsibility to ensure supervisors of research trainees have the appropriate skills, qualifications and resources. It is the institution's responsibility to provide ongoing training and education that promotes and supports responsible research conduct for all researchers and those in other relevant roles. This includes assisting researchers to develop their supervisory practice and follow their institution's policies and other relevant disciplinary-specific policies. Importantly, supervisors serve as role models to less experienced researchers and, as such, have obligations to maintain a high degree of professionalism and current knowledge of their field or discipline. Supervisors should reflect on their own competence to provide advice and seek objective feedback and support where necessary. In addition to reflecting the behaviours of good leadership described above, a supervisor needs to initiate regular discussions about good research practices with their students; facilitate and support access to education and training for junior researchers; create a respectful research environment where scientific critique is encouraged; acknowledge the work performed by junior researchers and recognise their contributions in a rigorous and fair manner, especially with respect to authorship of publications and on funding applications; develop their own knowledge and skills in communication with and management of staff; and endeavour to reduce harmful competition within the research team.

A mentorship program can help to facilitate a positive research culture by providing mentees with encouragement and a second opinion; by assisting them to manage their work pressures; by connecting them to relevant institutional and external support services and resources; by helping them to expand their networks of useful contacts; by challenging their ideas about what skills and achievements should be valued; and by providing input and feedback on good research practices at all stages of the research cycle.

PARTNERING WITH COMMUNITIES

Aboriginal and Torres Strait Islander researchers go to great lengths to navigate 'push and pull' between academy, community and family with regard to commitments, expectations and priorities. Institutional leaders could do a lot to alleviate these tensions by partnering with communities (including Elders, Traditional Owners, and Aboriginal and Torres Strait Islander researchers) to address these cross-way divergences.[32]

72%

of respondents to the 2019 NHMRC Survey agreed that mentoring programs that address research quality and career development are amongst the most significant interventions that could be taken by an institution to improve research quality.[12]

DESIRED OUTCOMES

An institution's research leaders and senior administrators model positive behaviours, attitudes, values and expectations including those that encourage collaboration, equity and sustainability of research career paths, and foster and support the careers of junior researchers.

3.1.2 Implementation

Implementation of better support systems for junior researchers, encouragement of enhanced collaboration and teamwork, and greater equity and sustainability of research career paths, will require a collaborative effort with institutions helping their staff to become better leaders, supervisors and mentors. Suggestions for how institutional leaders can help their staff to do this are provided below.

Table 3. Graded implementation: Modelling and Leadership

Phase	Suggested activities
Make it **possible** 	• Identify **training needs** in research leadership, supervision and mentorship, to determine where efforts should be focussed • **Consult with Aboriginal and Torres Strait Islander researchers and students** on their needs for experienced supervisors and mentors, both Indigenous and non-Indigenous • Consult with staff and students about implementing **mentorship programs** • Provide **funding, support and resources** (for example, administrative support, material resources) for training in leadership, supervision and mentorship • **Hire people** with appropriate qualifications and expertise, or **train existing staff**, to provide relevant training in supervision and mentorship, and assess competence
Make it **easy** 	• Ensure **training** in leadership, supervision and mentorship is open to a wide range of staff and held at times convenient to those with out-of-work responsibilities • Encourage staff to **participate** in relevant training • Ensure training opportunities are widely **publicised** • Ensure non-Indigenous supervisors and mentors receive training in **cultural competence and cultural safety**
Make it **normative** 	• Make the **qualities and characteristics** of good research leaders, supervisors and mentors a **regular topic for discussion** at meetings (for example, research group meetings, faculty meetings) and in communications from research leaders • Establish **formalised mentoring structures** for Aboriginal and Torres Strait Islander students and researchers • Establish **communities of practice** within/between institutions and facilitate regular meetings/social gatherings for peer support (with a focus on mentoring programs) • Establish an **Aboriginal and Torres Strait Islander-led researcher network** to support early and mid-career researchers and to forge closer connections between students and Aboriginal and Torres Strait Islander academics • Encourage both new and experienced supervisors to **reflect** on their own supervision practices and **seek objective feedback** to foster a culture of good supervision • Ensure **modelling** by research leaders through their active support for leadership/supervisor training and mentoring programs and that they undergo relevant training themselves • Provide **opportunities** for and encourage junior researchers, including Aboriginal and Torres Strait Islander researchers, to take on research leadership roles
Make it **rewarding** 	• **Recognise** supervision and/or mentorship of students in staff workload • Include evidence of supervision and mentorship competencies as part of **promotion and institutional award processes** • Establish faculty/school/institutional **awards** for staff who display exemplary research leadership/mentor/supervisory values and behaviours • Establish a system for **recognising staff** who demonstrate excellence in the provision of training in supervision and mentorship
Make it **required** 	• Include requirements for training in research leadership, supervision and mentorship in **institutional policies** • Provide clarity about **institutional expectations** for research leadership, supervision and mentorship in institutional policies, procedures and communications within the institution • Where appropriate, make research leadership, supervision and mentorship competencies a **KPI during performance appraisals and promotions.** For senior staff, an additional KPI could be the leadership, supervision and mentorship competencies of the staff they manage

PEER GENERATIVE POWER

Institutional leaders need to support and use peer generative power more strategically.

The unique strength of the power generated by cohorts of Aboriginal and Torres Strait Islander researchers from diverse backgrounds arises from their shared historical experience, co-understanding of problems with health and medical research and their shared aspirations to reform it. As a result, peer cohorts can have a much greater impact on Aboriginal and Torres Strait Islander peoples' health outcomes and on research capability strengthening. Such cohorts arise from informal networks, group facilitated research environments and university departments, and are led and driven by Aboriginal and Torres Strait Islander researchers.

Peers can generate new research partnerships, shared identities, inspire and nurture upcoming generations of researchers, provide role models and support networks. Peer generative power emerges from peer structures and uniquely enriches the educational and research experience for Aboriginal and Torres Strait Islander researchers.

The outcomes include increased confidence as an Aboriginal and Torres Strait Islander health researcher, better decision-making, strengthened expertise, extended understanding of research and its potential impacts, and more. The strength of these peer cohorts should be recognised by institutions in policy and practice.[32]

Self-reflection questions

The following sample self-reflection questions could be used as prompts for institutional leaders to determine their stage of implementation as outlined in Table 3.

SAMPLE SELF-REFLECTION QUESTIONS

- What level of funding, support and resources (for example, administrative support, material resources) is provided for training in leadership, supervision and mentorship?
- Who and how many staff undergo training in leadership, supervision and mentorship?
- How often are the qualities and characteristics of good research leaders, supervisors and mentors discussed at meetings (for example, research group meetings, faculty meetings) and in communications from research leaders?
- How does the institution reward staff who display exemplary leadership values and behaviours?
- How is the institution's requirement that its research leaders and senior administrators model positive behaviours, attitudes, values and expectations assessed and reflected in institutional policies?
- How does the institution provide a safe environment where issues about research leaders/supervisors/mentors can be raised at an early stage?
- How are institutional leaders supporting and using peer generative power for Aboriginal and Torres Strait Islander researchers?
- How are institutional leaders investing in Aboriginal and Torres Strait Islander leadership in research?

3.1.3 Case studies and scenarios

SCENARIO: RESEARCH QUALITY CHAMPIONS

It was after a team meeting where a postdoctoral fellow gave a presentation on research quality followed by a robust discussion, that the research team leader decided to hold a meeting with the other academic supervisors in the department to talk about how they could give issues surrounding research quality more focus. The result was the *Research Quality Champions*, a networking group in which early career researchers could discuss issues pertaining to research quality in a safe environment free from judgement. The idea for the network was based on the model of Research Integrity Advisors, as required by the *Australian Code for the Responsible Conduct of Research, 2018*[9], and the University of Cambridge's Data Champion program.[34]

A pilot for the *Research Quality Champions* network was actively supported by senior administrators and senior research leaders. Training by internal and external experts was organised for the Champions, in research quality issues, conflict resolution and change-making. The Champions now hold regular face-to-face meetings and have a virtual community space, to provide peer support and to exchange experiences and ideas.

Not only does the network allow researchers to seek advice about research quality practices from researchers external to their own team, but the Champions also help their institution to continually develop and improve its processes related to research quality and research culture. Evaluation of this pilot clearly indicated its success, and it has been expanded across all departments in the institution. Furthermore, participation in the network is soon to be recognised by institutional leaders in terms of workload and promotion criteria.

SCENARIO: LEARNING TO GIVE AND RECEIVE RESPECTFUL FEEDBACK

A team leader noticed that giving and receiving feedback during team meetings was becoming a little fraught as members were taking feedback as personal criticism and this was preventing what could have been constructive discussions about different ways of tackling problems from occurring. In response, the team leader engaged a facilitator to run a 'giving and receiving feedback' workshop with the team. Although some members were initially sceptical and saw it as an imposition on their time, they all participated, and it turned out to be a very worthwhile investment. The workshop gave the team a shared language and purpose around giving and receiving constructive feedback and having respectful conversations; the team felt valued; their communication skills improved; and much less time was spent diffusing tension and overcoming misunderstandings. In addition, the team leader noticed ideas were getting braver, which meant that projects were being taken in new and interesting directions.

CASE STUDY: OUTCOME OF POOR RESEARCH PRACTICES

Dr Marc Tessier-Lavigne, a highly-celebrated neuroscientist, famous for his studies on brain development, was president of Stanford University for seven years before an investigation into allegations that he might have been involved in fabricating scientific results led to his resignation in August 2023. The allegations related to his publications in journals, such as Nature, Science and Cell, between 2001 and 2008, when he was working at Genentech.

The report from the panel, established by Stanford University to investigate the allegations, cited flaws in twelve papers in which Tessier-Lavigne was either author or co-author and concluded that members of his laboratories had engaged in inappropriate manipulation of research data.[35] Tessier-Lavigne was a non-principal author on seven of these papers and the panel found that he was not aware of the manipulation of the research data and could not have been expected to have detected it.[36]

Although similar findings were made for the remaining five papers for which he was principal author, there were serious flaws in the presentation of the research data and apparent manipulation of research data by others with images duplicated or spliced on multiple occasions.[37] Tessier-Lavigne's oversight of his laboratory was found wanting and his leadership qualities called into question.[37]

There are important lessons to be learned for all researchers from Tessier-Lavigne's experience. Such repercussions for Tessier-Lavigne could have been avoided if he had confronted the questionable practices in his laboratories and insisted on corrections at the time. As the report says, 'he failed to decisively and forthrightly correct mistakes in the scientific record' when concerns arose about his papers.[37,38, 37]

The fact that multiple members of Tessier-Lavigne's laboratories have engaged in manipulation of research data, in three different institutions over a period of years, raises concerns about the culture of Tessier-Lavigne's laboratories.

While many of the postdocs interviewed for the report spoke of a positive laboratory culture, others reported a culture which rewarded postdocs who produced favourable results and marginalised those who did not.[37] The panel suggested that senior scientists should try to diffuse any unhealthy pressures that postdocs feel to please a principal investigator.

This episode has also prompted some scientific researchers to question whether scientists who hold major, administrative positions are also able to properly oversee large, active laboratories and provide junior researchers with the quality mentorship that they deserve.[39]

3.2 Institutional resources to support the conduct of high-quality research

3.2.1 Introduction

An institution's commitment to, and the value it places on, the conduct of high-quality research can be demonstrated by the provision of expert and technical advice, administrative support and material resources for conducting high-quality research, to all relevant staff and students. This, in turn, can reinforce a positive research culture. Activities that facilitate the conduct of high-quality research, such as mentoring, education and training, and the provision of rewards and recognition require resource allocation.

18% *of research students/researchers responding to the 2019 NHMRC Survey reported that they find it difficult to conduct research in a responsible manner because of insufficient access to human resources (for example, statistical expertise, technical/administrative support).*[12]

DESIRED OUTCOMES

Institutional leaders provide adequate support, or access to appropriate external support, for conducting high-quality research including expert and technical advice, methodological input and support, administrative support and material resources.

3.2.2 Implementation

Institutional leaders should aim to provide sufficient resources to support the conduct of high-quality research.

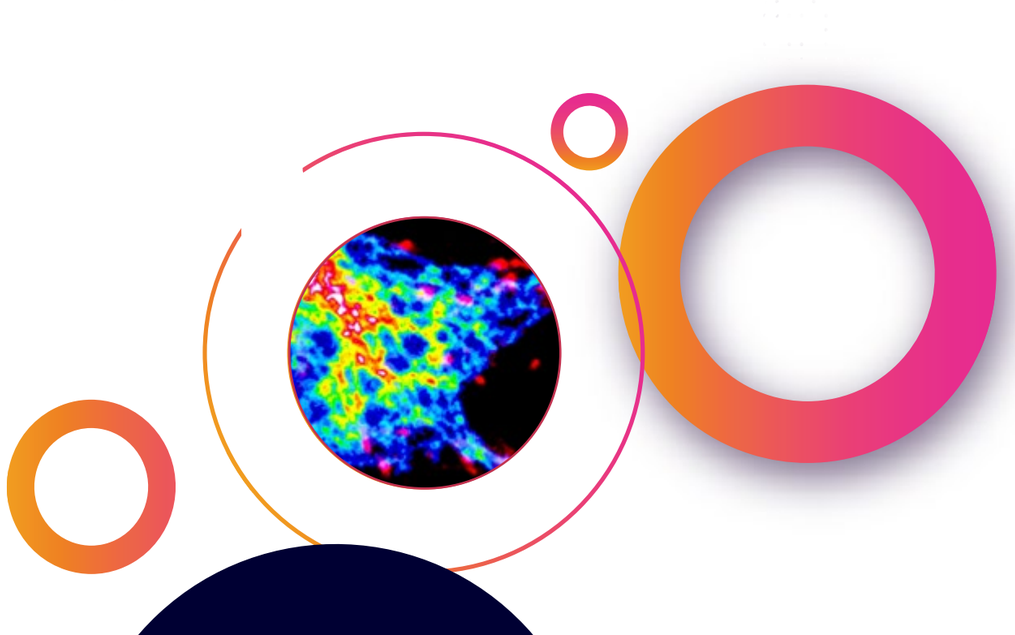
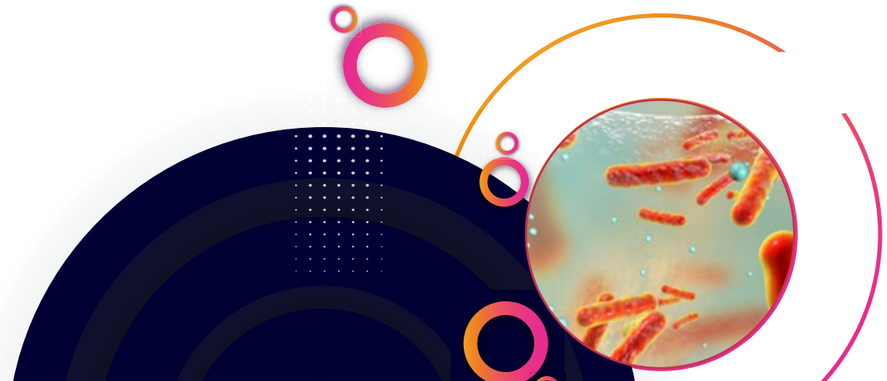
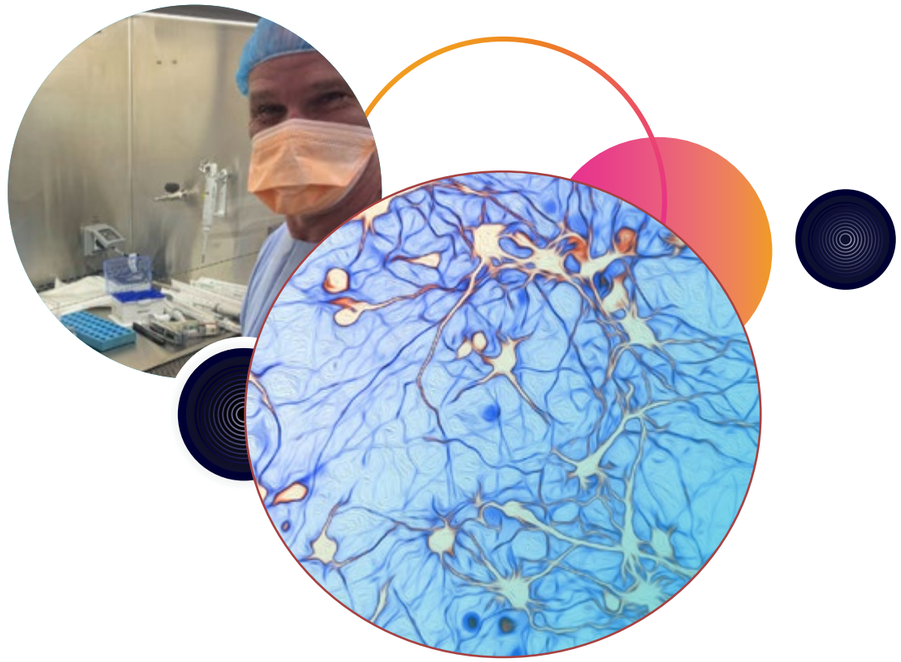


Table 4. Graded implementation: Institutional resources to support the conduct of high-quality research

Phase	Suggested activities
Make it **possible**	• **Identify and gather information** on good research practices and research quality issues • Examine faculty/school and institutional policies relevant to the conduct of good research practices and determine where extra **resources** are needed to put policies into practice • Establish centrally provided **statistical support** that all researchers can access for advice at key points in the research cycle (for example, planning, ethics application, analysis, writing publications) • Appoint, train and support **Research Quality Advisor(s)** to provide advice to all institutional staff on matters relating to research quality • **Hire staff** with relevant expertise in good research practices and/or **train existing staff** to become experts in good research practices • Provide **infrastructure** for supporting good research practices, such as: ◦ repository infrastructure to support open access to research outputs like publications ◦ data storage infrastructure to manage, curate and store data and code in accordance with Findable, Accessible, Interoperable and Reusable (FAIR) principles ◦ tools for transparent record keeping, for example, Electronic Laboratory Notebooks • Provide **internal independent peer review** of: ◦ research plans for potential research quality issues ◦ publications (before and after publication) • Establish an institutional **Community of Practice** for discussing good research practices • Establish an **Aboriginal and Torres Strait Islander-led researcher network** to support early and mid-career researchers and to forge closer connections between students and Aboriginal and Torres Strait Islander academics
Make it **easy**	• Set aside **funding** for quality improvement practices • Gather **data and evidence** on what policies work at your institution • **Support** centres and standard frameworks for specific types of research (for example, clinical trials, Indigenous research) • **Appoint** qualified statisticians as advisors to/members of Human Research Ethics Committees and Animal Ethics Committees • Provide **easy access** to: ◦ staff with **expertise** in good research practices (for example, statistical advice; veterinary advice for animal research) ◦ **infrastructure** for supporting good research practices ◦ **independent peer review** of research plans and publications ◦ **information** on good research practices (website, intranet, internal communications, training) • Support and facilitate **opportunities for collaboration** across the institution to support good research practices including through the Community of Practice • Support Aboriginal and Torres Strait Islander students and researchers to form **peer networks**

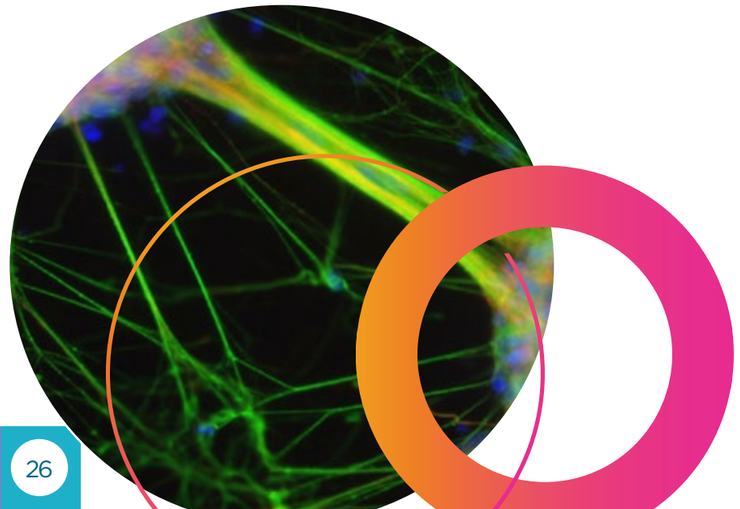




Phase	Suggested activities

Make it **normative**	• Research leaders to **provide an example** to other researchers by:
	  ◦ using institutional resources that support good research practices
	  ◦ using and promoting centrally provided statistical support
	  ◦ promoting processes for independent peer review of research plans and publications
	  ◦ supporting the community of practice within the institution for discussing good research practices
	• Include institutional resources that are available for supporting the research being conducted as a regular item for **discussion** during research group and faculty/school meetings
	• Provide regular **information** about institutional resources for supporting good research practices in internal communications
	• Research leaders to **maintain awareness** of the latest research on research quality
	• Support staff to attend **conferences** on quality and be open to hosting conferences and meetings on research quality
	• Continue to support **peer networks** of Aboriginal and Torres Strait Islander students and researchers which come together to produce peer generative power

Make it **rewarding**	• Include expertise in good research practices as a criterion for **staff performance review** • **Recognise** staff (informally and formally) who provide internal independent peer review of research plans and publications • Develop **incentives** for staff to take advantage of centrally provided services for example, statistical support, repositories for publications, data storage infrastructure, transparent record keeping, communities of practice etc. • Appropriately **acknowledge** staff who provided their expertise and ensure that they are included as authors where appropriate • Formally recognise Aboriginal and Torres Strait Islander students and researchers who use **peer generative power** to produce outputs, processes and actions which improve the quality of research practices



Phase	Suggested activities
Make it **required**	• Ensure **policies and procedures** for resource allocation within the institution include the conduct of high-quality research • Require researchers with projects that involve statistical analysis to **seek statistical advice** at key points in the project • Require research data and code to be made **FAIR**[79] • Require governance of Indigenous data to accord with the **CARE principles**[40] • Mandate the use of tools for **transparent record keeping** • Mandate the use of **independent peer review** of research plans and publications

Self-reflection questions

The following sample self-reflection questions could be used as prompts for institutional leaders to determine their stage of implementation as outlined in Table 4.

SAMPLE SELF-REFLECTION QUESTIONS

- Has the institution established an adequate statistical support service that all researchers can access for advice at key points in the research cycle?
- How have institutional policies and procedures been modified to support a positive research culture and good research practices?
- How do institutional leaders encourage the use of infrastructure for supporting good research practices?
- How are staff who provide internal independent peer review of research plans and publications recognised?
- How does the institution ensure that its policies and procedures for resource allocation include consideration of the conduct of high-quality research?
- How does the institution recognise the value of peer generative power for producing outcomes, processes and actions which improve the quality of research practices?
- How are manuscripts reviewed prior to their submission for publication to ensure accurate reporting?

3.2.3 Case studies and scenarios

CASE STUDY: INSTITUTIONAL RESOURCES PROVIDED TO ENSURE CLINICAL TRIALS ARE REPORTED

In response to publicity in 2019 indicating that only 17% of clinical medicine trials at European universities had reported their results, The Karolinksa Institute (KI) decided to address this issue at their own institution.[41,42]

By 2022, KI was reported to have uploaded the most results between December 2020 and November 2021 and received international praise from TranspariMED for their initiative.

The following steps were important to the success of the initiative:

- Having the support of management who could ensure that resources were allocated for the long-term. They centralised responsibility for the registration and reporting of clinical trials/ studies to its existing research support unit and hired two additional full-time staff for this unit.
- Making it easy for researchers to register their clinical trials. Staff developed a template containing the same mandatory fields as in the European clinical trials portal. Researchers were able to complete the template with trial results without having to learn how to navigate the portal. The support staff then easily and efficiently upload the results to the portal on behalf of the researchers.
- Developing an internal website with important and detailed information about registration and reporting of clinical trials so that researchers can easily find what needs to be done and how. The website includes a step-by-step guide for various trial registers and frequently asked questions.
- Providing specific support for researchers. The Chief Data Officer offers individual research support via email, as well as lectures and workshops, about what is required and how it is carried out.
- Joining networks of other researcher administrators working with registration and reporting. The Chief Data Officer found this to be a good way to make valuable contacts who could provide advice and tips.

SCENARIO: SENIOR ROLE - ACADEMIC LEAD FOR RESEARCH IMPROVEMENT

Institutions can create formal roles in their senior management teams (an Academic Lead for Research Improvement or similar) with responsibility for, and supporting implementation of, activities to support the conduct of high-quality research.

This approach is based on a key element of the UK Reproducibility Network (UKRN).

The UKRN was established as a peer-led organisation, with the aim of raising research quality and promoting initiatives that may help achieve this, as well as supporting a positive research culture.

This includes the investigation of factors that contribute to robust research, promoting training activities and disseminating best practice, and working across local networks, institutions, and external stakeholders to ensure coordination of efforts across the sector.

The key feature of reproducibility networks is their structure, which is flexible enough to allow for national, institutional, and disciplinary differences, while also enabling coordination of activity within and between these agents in the research ecosystem.[43,44]

Key features of the UKRN are:

- local networks – informal, self-organising groups of researchers and other staff at individual institutions, represented by a Local Network Lead
- institutions – universities that have formally joined the Network by creating a senior academic role focused on research improvement
- other sectoral organisations – organisations that have a stake in the quality of research (for example, funders, publishers, learned societies).

Institutions in Australia can consider joining the Australian Reproducibility Network, which has been recently established based on the UKRN.[45]

SCENARIO: APPOINTMENT OF A BIOSTATISTICIAN TO THE HUMAN RESEARCH ETHICS COMMITTEE

The Chair of a Human Research Ethics Committee (HREC) was struck by the apparent poor knowledge of biostatistics amongst those conducting research involving human participants. Following consultation with a senior manager in the institution, a qualified biostatistician was appointed as a member of the HREC. Initially, the biostatistician found problems with the biostatistics and protocol design in roughly one quarter of the research protocols in applications submitted to the HREC. Errors included simple ones such as being unable to replicate sample size, incorrect use of commercial statistical software and incorrect protocol design. The institution also supported a system of 'biostatistician interns' for the HREC – biostatistics students who had the chance to look at real world protocols as part of their studies.

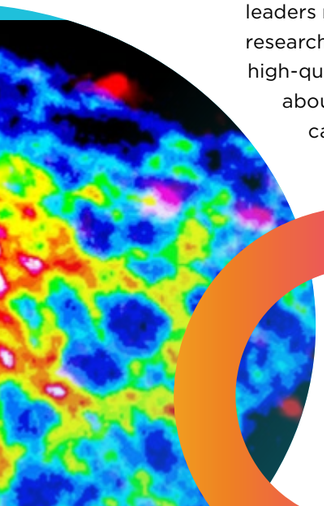
Addressing these issues in consultation with the researchers led to improvements in research design and analysis, which are essential for the conduct of high-quality research. It also demonstrates respect for the participants in the research because well-designed research and appropriate analysis of the results are more likely to lead to useful outcomes.

3.3 Education and training about good research practices

3.3.1 Introduction

Researchers engage in ongoing development of their knowledge and skills throughout their careers. On the job training has traditionally been the pathway by which research students and researchers gain proficiency in research skills. Although many Australian institutions do provide training for their researchers about good research practices, it is internationally recognised that there is a need for greater consistency in the content, delivery and assessment of learning and educational resources.

Seventy-two per cent of respondents to the 2019 NHMRC Survey indicated that provision of professional education, training and supervision was a key feature of the research environment that encouraged the production of high-quality research.[12] Institutional leaders need to provide effective and continuing education and training about good research practices so that researchers have the necessary competencies to conduct high-quality health and medical research, as well as having a common understanding about the requirements and expectations for its conduct, throughout their research career.



DESIRED OUTCOMES

- Institutional leaders provide, support and promote effective and continuing education and training of researchers about good research practices.
- Researchers have the knowledge and skills essential for the conduct of high-quality research.
- Time spent on education and training about good research practices is valued by institutional leaders rather than being regarded as time wasted.

3.3.2 Implementation

Competency-based education and training and attainment of competencies is an increasingly common approach that has been adopted in many professions such as teaching, health, medicine, nursing, engineering, pharmacy, dietetics[46,47,48,49], and in areas such as public health,[50,51] evidence-based practice in health care[52], statistics[53], clinical trials[54] and animal research.[55]

Key considerations for institutional leaders when developing or reviewing competency-based education and training programs for researchers include (but are not limited to):

- regular evaluation of the education and training needs of members of the institutional research community
- recognition that participation in training does not equate to attainment of a competency
- the necessity for the programs to accord with national standards for competency-based education and training, and include mechanisms for assessment of competence by a qualified assessor
- that the programs need to be accessible, suitable, flexible, practical, engaging, relevant and implementable
- how to meet the needs of individual researchers; for example, an experienced researcher (and recognition of prior learning) versus less experienced researcher/student
- the variety of routes to achieving competency in addition to formal lectures/tutorials and the traditional 'master-apprentice' model used for PhD training, with the attainment of some competencies better suited to education via supervision
- the variety in the timing of delivery so that necessary competencies are maintained, and new competencies are attained as required, during a researcher's career
- provision of adequate support, resources and promotion of relevant programs
- regular assessment of the outcomes of the education programs with appropriate modification when required.

Table 5. Graded implementation: Education and training of researchers

Phase	Suggested activities
Make it **possible** 	• **Evaluate** education and training needs to identify where to focus efforts[56] • **Identify** education and training needs of Aboriginal and Torres Strait Islander students and researchers • Provide **funding** for education and training, and assessment of competence • Provide **support and resources** (for example, expert, technical, and administrative support, infrastructure, material resources, list of recommended training/tools) for all modes of delivery • **Hire people** with appropriate qualifications and expertise, or **train existing staff**, to provide relevant education and training, and assess competence • **Establish** a staff member whose responsibilities include the administration and coordination of the education and training of researchers • Ensure research leaders actively **support** education and training programs

Make it **easy** 	• Provide clear information about **processes** for achieving competencies
	• Provide **variety in modes and timing of delivery** so that education and training is accessible, suitable, flexible, practical, engaging, relevant and implementable and meets the individual's needs (for example, experienced researcher versus less experienced researcher/students, cohort-based learning for Aboriginal and Torres Strait Islander students)[32,57,58]
	  ◦ Modes include classroom/lecture-based learning, tutorial, practical, online, mentorship, simulated environment, theatrical, gamification and quizzes
	  ◦ Timing includes undergraduate, postgraduate, and early career researcher stages; on recruitment; regular refresher; 'advanced' programs for senior researchers; ongoing during conduct of particular activities
	• Provide a process for **recognition of prior learning** so that experienced researchers can be assessed for competence prior to undertaking formal education and training
	• Provide **easy access** to support and resources for training (expert, technical and administrative support, as well as material resources)
	• **Support** implementation of new knowledge and skills in the workplace
	• **Assess the effectiveness** of the education and training programs and modify as required

Make it **normative** 	• Make competencies related to good research practices a regular/standing topic for **discussion** at research group meetings and in communications from research leaders • Remind staff and students of the **institution's expectations** about the attainment of competencies, and relevant legislation and codes of conduct, that apply to their work (for example, at research group meetings, internal communications) • Include education and training about good research practices and attainment of competencies in standard human resources and research higher degree **processes** for staff and PhD students. This includes any 'welcome packs' or onboarding for new staff and students. • Establish **communities of practice** within/between institutions and facilitate regular meetings/social gatherings for peer support • Establish an **Aboriginal and Torres Strait Islander-led researcher network** to support early and mid-career researchers and to forge closer connections between students and Aboriginal and Torres Strait Islander academics • Ensure research leaders **attain relevant competencies** themselves
Make it **rewarding** 	• Include relevant education, training and attainment of competencies in **promotion criteria** • Establish a system for **recognition** within research groups of competencies that have been achieved by group members • Create **incentives** to reward research groups that have high engagement rates in education and training • Establish institutional **awards** for excellence in provision of education and training and mentoring
Make it **required** 	• Include the requirements for and attainment of competencies in **applications for ethics approval** for human and animal research (for example, specific training in animal research procedures) • Include requirements about education and training and attainment of competencies in **institutional policies** • Provide clarity about **institutional expectations** in policies, procedures and communications • Require **compulsory education and training** and attainment of competencies about good research practices for all research career stages • Make relevant education and training and attainment of competencies a KPI during **performance appraisals and promotions**; for senior staff an additional KPI could be the education and training of the staff they manage • Develop systems for **regular audit** of competencies attained • **Verify** whether the education and courses provided are helping staff attain core research competencies

The following sample self-reflection questions could be used as prompts for institutional leaders to determine their stage of implementation as outlined in Table 5.

SAMPLE SELF-REFLECTION QUESTIONS

- In addition to funding, what kind of support and resources (for example, expert, technical and administrative support, infrastructure, material resources, list of recommended training/ tools) are provided for all modes of delivery of education and training?
- What are the different modes of delivery and how will they be provided to ensure that the training is accessible, suitable, practical, engaging, relevant, implementable and meet the individual's needs?
- How does your institution encourage and facilitate peer support for competency-based education and training about good research practices?
- How does the institution recognise research groups that have high engagement rates in education and training?
- What requirements for education and training in good research practices, are included in institutional policies?
- How do institutional leaders measure and check compliance with attainment of relevant competencies?

3.3.3 Case studies and scenarios

CASE STUDY: IMPROVING EXPERIMENTAL DESIGN THROUGH EDUCATION AND TRAINING

The Baker Heart and Diabetes Institute recognised international concerns about the reproducibility of preclinical animal research and experimental design issues, such as randomisation methods, allocation concealment and blinding.[59] With the support of senior management, the Institute undertook an exercise to encourage preclinical researchers to improve the quality of their cardiac and metabolic animal studies. This involved provision of education and training to increase awareness of concerns which can arise from suboptimal experimental designs, and provide knowledge, tools, and templates to overcome bias. Participants received a one-hour presentation that included questions and discussion on concerns regarding the quality of animal research, the ARRIVE Guidelines, types of bias, and practical examples for improving experimental design. They also attended a seminar on improving disease modelling and candidate drug evaluation, and were provided with flowcharts and templates to encourage them to track and report exclusions of animals. Two short surveys were conducted over 12 months to monitor and encourage changed practices. The major findings included:

- a willingness of investigators to make changes when provided with knowledge and tools that were relatively simple to implement, for example, structured methods for randomisation, and de-identifying interventions/drugs
- resistance to change if this involved more personnel and time
- evidence that changes to long-term habits require time, follow-up, and incentives/mandatory requirements.

CASE STUDY: THE DILEMMA GAME: AN APP TO STIMULATE CRITICAL DISCUSSION

Like in any profession, researchers are frequently faced with dilemmas: Can I exclude particular observations from my research? Can I use exactly the same data set for multiple papers?

The Dilemma Game app has been developed by Erasmus University Rotterdam to stimulate awareness of, and an open and critical discussion about, integrity and professionalism in research.[58] The game prompts participants to consider, choose and defend (and possibly reconsider) alternative courses of action regarding a realistic dilemma related to professionalism and integrity in research. The game consists of dilemmas with four possible courses of action which the players can choose from. It is important to note that due to the complexity of integrity-related dilemmas, there is no winning or losing in this game. Rather, by defending and discussing these choices in the context of a critical dialogue, the game aims to support researchers in further developing their moral compass. The game can be used in a variety of settings, and has three modes: Individual, Group, and Lecture.

For some years, the Dilemma Game was played as a card game. In 2020 the game was digitalised in order to reach a wider audience and inspire continuous attention to the topic of research integrity. Discussing research integrity is vital as it contributes to an open, safe, and inclusive research culture in which good research practices are deeply embedded.

CASE STUDY: DESIGNING INTEGRATED RESEARCH INTEGRITY TRAINING

When the Queensland University of Technology (QUT) decided to develop training courses about research integrity practices in authorship, publication, and journal peer review, they could find no universally agreed method on how best to conduct such training.

Although QUT already had a single comprehensive online course covering many topics relating to research integrity, they weren't convinced that it was effective or instilling ethical behaviour in a lasting way. In response, they developed an 'integrated training method' in which they *promote* good research practices rather than explicitly teaching them.[60] They do this by interspersing the researcher's primary ethical responsibilities with other relevant practical research skills, throughout the course material.

For example, their goal is to make good authorship and publication practices normative. To achieve this, in their *Authorship and Publication* course, they incorporate the researcher's primary ethical responsibilities relating to authorship and publication into the context of achieving publication of their research.

Similarly, a discussion of research data management includes reproducibility and data sharing; and a course on journal peer review has fairness, competence, transparency and confidentiality incorporated into the training. In two and a half hours of face-to-face learning, they cover a variety of interrelated topics using a series of lightning talks, animated videos

and short interview clips of senior academics presenting their views from different disciplinary perspectives. Course materials, and links to further information, are provided immediately after the sessions allowing the audience to listen rather than take notes. In addition, participants can watch supplementary videos available on the course website or join one of the university's academic writing circles.

A remaining challenge is how best to formally evaluate the training in order to determine whether learning has occurred and then in the longer term, whether the institution's research culture has improved.

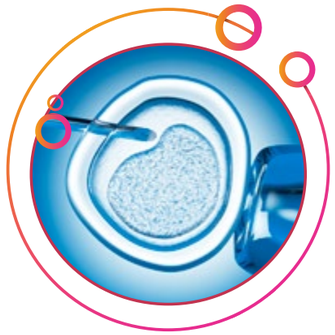
3.4 Rewards and recognition

3.4.1 Introduction

There is a clear and growing international consensus for the need to reform researcher assessment practices to further support the quality of research and the attractiveness of research environments.[61,62,63,64] The current assessment of researchers relies on a narrow set of quantitative journal and publication-based metrics such as the Journal Impact Factor, Article Influence Score and h-index as proxies for quality and impact.

These assessment processes focus too strongly on past performance, they promote quantity and speed at the expense of quality and rigour and promote individualism over collaboration. Furthermore, there is mounting evidence to show that assessment processes that rely on publication and journal-based metrics are prone to multiple biases and discrimination.[61] Forty-four per cent of respondents to the 2019 NHMRC Survey felt that the features that had the most negative effect, and hence discouraged the production of high-quality research, were emphasis on publishing in top-tier journals and how researchers are assessed for promotion.[12]

A positive research culture is supported by assessment practices that recognise collaboration, openness, and engagement with society, while providing opportunities for multiple talents.[61] It is now widely accepted that the assessment of researchers should recognise diverse outputs, practices and activities that maximise the quality and impact of research.[24,65,66,67] By rewarding and recognising activities and behaviours that support such a culture, institutional leaders can play an important role in encouraging and reinforcing those activities and behaviours, which ultimately contribute to the conduct of high-quality research.



DESIRED OUTCOMES

- Criteria for assessment of researchers (for example hiring, promotion, rewards and recognition) include measures relevant to research quality, and recognise the diversity in high-quality research activities, practices and outputs.
- Criteria and processes for rewards and recognition are transparent.

3.4.2 Implementation

Rewarding and recognising good research practices and contributions to a positive research culture can be achieved through formal processes such as appointment, promotion and awards, and through informal processes such as peer recognition.

Aboriginal and Torres Strait Islander university researchers are frequently asked to take on workloads beyond their formal roles or employment arrangements. For example they are often asked to contribute to specific events university-wide, to connect Aboriginal and Torres Strait Islander communities with universities, to sit on committees, to run cultural awareness training for university staff and students, to be a representative at a NAIDOC event, to join a research advisory group, revise and review Aboriginal employment plans and Reconciliation Action Plans, and yet they are not recognised or remunerated for such roles. All of these activities are time consuming and leave less time for conducting research. Institutional leaders need to highlight, recognise and appropriately remunerate such roles.[32]

Table 6. Graded implementation: Reward, recognition and incentives

Phase	Suggested activities

Make it **possible**	• In consultation with the institutional research community, **evaluate** processes and criteria for the following, and identify areas for improvement:
	  ◦ rewards and recognition for good research practices
	  ◦ hiring and promotion
	• **Examine what behaviours are promoted** in the institution, and whether these behaviours contribute to a positive research culture and high-quality research. Tools such as the S.P.A.C.E. rubric[68], and the Hong Kong Principles[69] may assist institutional leaders to identify where they might focus activities for improvement,
	• Develop clear **guidance** about assessment of researchers for hiring and promotion and seek regular input from staff and students on this guidance. Criteria for appointment and promotion should take into account gender balance in the workplace and recognise achievement relative to opportunity

Phase	Suggested activities
Make it **easy**	• Provide **easily accessible information** on processes for assessment of researchers • Provide **advice** about activities that do not support good institutional research culture, such as journal impact factors, number of publications, and awards whose criteria are based on the quantity instead of the quality of research • Develop **clear guidance** for staff involved in recruitment and promotion decisions that explicitly cautions against the inappropriate use of publication metrics and encourages them to value a full and diverse range of research outputs and contributions[63] • Provide **support** to staff involved with hiring and promotion; for example, providing examples of questions that can be asked in interviews that focus on good research practices

Make it **normative**	• Progressively implement criteria relevant to research quality in **hiring and promotion** guidelines and procedures. Inform researchers about such changes and ensure they understand that criteria relevant to research quality will be considered by appointment and promotion committees.
	• Include information in **staff inductions** about a positive research culture, good research practices and how these are relevant to performance and promotion criteria
	• Regularly **recognise** good research practices at research group meetings, for example:
	  ◦ positive role modelling and good leadership behaviours by research leaders
	  ◦ good research practices and behaviours by early career researchers

Make it **rewarding**	• Provide **informal appreciation** in the form of personal thanks verbally or via email at any time to staff and students producing high-quality research • Provide **public acknowledgement** at faculty/school meetings of research groups who are championing research quality • Provide **development opportunities** (for example, opportunity to work on a project that provides 'stretch' goals, attendance at education and training courses, shadowing of a senior staff or group member) • Provide research group, faculty/school, and/or institutional **awards/grants** for excellence in quality of development, design, methodology, conduct and analysis of research[70,71,72] • Provide **excellence awards** for mentoring, research training and supervision that have criteria beyond the numbers of students supervised (for example, examples of good mentorship and supervision) • **Recognise Aboriginal and Torres Strait Islander researchers** for their contributions to the broader university culture by offering career advancement opportunities
Make it **required**	• **Formally sign declarations** that forgo the use of simplistic metrics in research assessment, such as DORA[73] and CoARA[74] • Include **assessment criteria** relevant to research quality in formal institutional policies for hiring and promotion • Make **public statements** on rewards, recognition and incentives (for example, those produced by the United Kingdom Reproducibility Network [75,76]) • **Prohibit** the use of language in job advertisements that refers directly or indirectly to specific journals as a proxy for quality • Ensure **rewards** do not have criteria based on impact factors or other simple metrics • Ensure that Aboriginal and Torres Strait Islander researchers are appropriately **remunerated** for their contributions to the broader university culture

Self-reflection questions

The following sample self-reflection questions could be used as prompts for institutional leaders to determine their stage of implementation as outlined in Table 6.

SAMPLE SELF-REFLECTION QUESTIONS

- What criteria does the institution have for rewarding and recognising good research practices, when making appointments, promotions, awards and informal peer recognition?
- Has the institution developed clear guidance for staff involved in recruitment and promotion decisions that explicitly cautions against the inappropriate use of publication metrics and encourages them to value a full and diverse range of research outputs and contributions?
- Have institutional leaders informed researchers that hiring and promotion criteria will focus on good research practices and hence a diverse range of research outputs and contributions?
- How do the institutional leaders recognise and/or reward examples of good mentorship and supervision, excellence in quality of development, design, methodology, conduct and analysis of research?
- What requirements regarding assessment criteria relevant to research quality exist in formal institutional policies for hiring and promotion?

3.4.3 Case studies and scenarios

CASE STUDY: EVALUATING FOR HIRING AND TENURE

When the QUEST (Quality-Ethics-Open Science-Translation) Center for Transforming Biomedical Research at the Berlin Institute of Health in Germany evaluates applications for hiring and tenure, criteria include good research practices, with questions covering practices such as publishing of null results, open data and stakeholder engagement.[77] QUEST office staff screen applications and participate in hiring committee meetings to support committee members in understanding, evaluating, and applying the criteria.

CASE STUDY: EVALUATING RESEARCH STAFF

University Medical Center Utrecht in the Netherlands undertook a consultative process with staff to develop a new framework for evaluating staff for promotions that moved away from bibliometrics and formally required qualitative indicators and a descriptive portfolio.[78] Along with other elements, Utrecht candidates now provide a short essay about who they are and what their plans are as faculty members. Candidates must discuss their achievements in terms of the following domains with bibliometrics comprising only one domain:

- managerial responsibilities and academic duties, for example, conducting reviews for journals and contributing to internal and external committees
- teaching and supervision of students, for example, how much time is devoted to students and any courses they have developed
- describe any clinical work undertaken, for example, involvement in organising clinical trials and research into new treatments and diagnostics
- entrepreneurship and community outreach.

Reported outcomes of this change are:

- group leaders engaging with, debating about and then embracing the new framework
- early- and mid-career researchers engaging with the framework and proposing forward-looking ideas to improve science
- students organising a brainstorming session with high-level faculty members about how to change the medical and life-sciences curriculum to incorporate reward-and-incentive structures
- the PhD council choosing a ‘supervisor of the year’ on the basis of the quality of supervision, instead of the previous practice of the highest number of PhD students supervised.

SCENARIO: SENIOR ROLE ACADEMIC LEAD FOR RESEARCH IMPROVEMENT

The leaders of a research group were aware that although they had invited a speaker to their regular meeting to speak about transparent research behaviours and had followed up with an email with links to resources, there had been no change in uptake of those behaviours. They decided to implement a reward scheme, where any member of the research group could receive $100 as a dining/movie/retail voucher, or as a contribution to their research account, for:

- pre-registering their research project
- preparing a data management plan, including to share the data at the end of the project
- depositing a preprint of any manuscript
- making any publications openly accessible
- sharing data from the project based on the FAIR principles (Findable, Accessible, Interoperable and Reusable)[79]
- publishing code from the project.

When communicating about this reward scheme, the research group leaders were careful to stress that it was not intended as a reward based on metrics. Because each of the behaviours that were eligible under the reward scheme were measurable, the leaders were able to see a quantifiable improvement in the behaviours after 12 months.

3.5 Reporting and addressing research quality issues

3.5.1 Introduction

Institutional leaders can facilitate a positive research culture by taking effective, swift and positive action when poor research practices occur, to reinforce an environment where good research practices are the ‘norm’ within the institution. Whilst behaviours such as research misconduct and poor interpersonal behaviour like bullying are critical issues that also affect research culture, institutional strategies for managing these behaviours lie outside the scope of this document.

43% *of research students / researchers responding to the 2019 NHMRC Survey reported that they had witnessed others propose a research question which was easy to answer rather than needed.*

25% *of research students / researchers responding to the 2019 NHMRC Survey admitted to personally not attempting to publish a valid ‘negative’ or ‘neutral’ study.*[12]

DESIRED OUTCOMES

- Institutional leaders provide support for reporting potential poor research practices at all levels, including support for people who make reports.
- Issues that may affect research quality are addressed effectively at an early stage.
- Unhealthy competition, publication pressure, detrimental power imbalances and conflicts are explicitly addressed and adequately handled.

3.5.2 Implementation

Institutions should provide clear, supported pathways for anyone to raise concerns surrounding research quality practices. If in response, institutional leaders focus on rectifying the concerns rather than taking punitive measures, then valuable lessons are more likely to be learned by all those involved.

Table 7. Reporting and addressing potential research quality issues

Phase	Suggested activities
Make it **possible** 	• **Identify** people within the institution (for example, research quality advisors) to whom concerns about potential research quality issues can be reported (more than one person to minimise potential conflicts of interest) • Develop a **procedure for reporting** potential research quality issues, including guidance on what and how to report • Develop a **procedure for managing** reports of potential research quality issues including possible actions to take, such as requiring education and training or accessing institutional resources to support good research practices • Develop **procedures that protect and support** people who report research quality issues • Pilot **procedures for reporting and addressing** potential research quality issues (for example, using scenarios and role play) so that any problems with the procedures can be resolved before they are used in real-life situations • Provide **funding** for staff and students to **attend external training** on research quality
Make it **easy** 	• Make **easily accessible:** ◦ the procedure for reporting potential research quality issues ◦ contact details for the persons to whom concerns about potential research quality issues can be reported ◦ the procedure for how to manage reports of potential research quality issues ◦ the procedure for providing support to and protecting people who report research quality issues • Provide **training** for staff who receive and manage reports about potential research quality issues
Make it **normative** 	• Include improving research practices and discussing research quality issues as a regular item for **discussion** during research group and faculty/school meetings • **Collect data** on the reporting and identification of potential research quality issues and conduct ongoing monitoring of the effectiveness of the reporting procedures • Provide **regular information** about the procedure for reporting potential research quality issues in internal communications to all staff and students • Disseminate regular **anonymised reports** to all those within the institution about the outcomes of reporting potential research quality issues • Provide information **in staff induction materials** on the procedures for reporting potential research quality issues and for providing support to and protecting people who report such issues • Highlight **national and international seminars** on research integrity, and highlight changes in **national or international policy** on research integrity
Make it **rewarding** 	• **Recognise** research groups that demonstrate good management of reporting of potential research quality issues (including maintaining confidentiality where necessary), such that they lead to improved research practices within the group • Ensure that staff who respond to research quality issues have this role **recognised when they apply for positions or promotion**

Phase	Suggested activities
Make it **required**	• Embed in appropriate group, faculty/school, induction and institutional **policy documents** the procedures for reporting concerns about potential research quality issues, managing such reports, and providing support and protection to people who make reports • Include management of reporting of potential research quality issues in accordance with **institutional policies and procedures** as part of performance reviews for supervisors, heads of research groups, and heads of faculties/schools • Provide **information to the governing authority of the institution** (for example, university senate, an institute's board) on the outcomes of reporting about potential research quality issues on an annual basis (anonymised as appropriate) • **Commit to annual public reporting** on the number and type of research quality issues • **Engage** an appropriately qualified external person to assess the institution's systems for reporting research quality issues

Self-reflection questions

The following sample self-reflection questions could be used as prompts for institutional leaders to determine their stage of implementation as outlined in Table 7.

SAMPLE SELF-REFLECTION QUESTIONS

- What procedures does the institution have in place for how to report research quality issues; for managing such reports including what actions to take; and for supporting and protecting people who make reports about research quality issues?
- How easily accessible to all those involved with the conduct of research are the procedures for reporting potential research quality issues?
- What sort of training exists for staff who receive and manage reports about potential research quality issues?
- How often are research quality issues and ways of improving research practices raised at research group and faculty/school meetings?
- How are the procedures for reporting potential research quality issues, managing reports and providing support and protection to people who report such issues included in faculty/school, induction and institutional policy documents?

3.5.3 Case studies and scenarios

SCENARIO: PROTECTION OF PEOPLE WHO REPORT RESEARCH QUALITY ISSUES

A team leader was very keen to gain a promotion but was worried about their publication record. They started pressuring their PhD students to hurry up with their experiments and get a publication out. When the students presented their experimental results at a team meeting, the team leader suggested that they delete the outliers from their data to speed things up. The students were unaware that this was the wrong thing to do and followed the advice. One of the post-doctoral fellows in the team became aware of what had happened and finding the environment to be very destructive to the team's mental well-being, decided to take action by reporting the situation to the institution's Research Quality Officer. Staff at the Research Office followed the institution's procedures to maintain confidentiality of the identity of the postdoctoral fellow and discussed the issue separately with the students and the team leader.

It was resolved that the whole team would attend, together, some face-to-face tutorials to improve their skills in statistical analysis; that matters of research quality would be regularly presented and discussed at team meetings; and that the team leader would attend counselling sessions about how to be a better supervisor. The students and the postdoctoral fellow were happy with the resolution and felt confident that if another situation arose, they would be listened to, and the Research Quality Officer would take any complaints seriously and act on them.

SCENARIO: DEVELOPMENT OF RESEARCH QUALITY PROMOTION PLAN TO ADDRESS RESEARCH QUALITY ISSUES

A large cohort of postdoctoral fellows in the Immunology Department at a medical research institution were very aware of how little time they had to get their experiments working and papers published before they would have to start looking for their next position. They knew that there were never enough positions to go around, hence there was a lot of unhealthy competition and the pressure to publish was intense. They stopped socialising with each other and started working longer hours. In their haste to publish, some of them resorted to using questionable research practices such as selectively promoting their most statistically significant findings.

A few of the team leaders became aware of this over the course of some months when the postdoctoral fellows presented their findings at departmental seminars, and they concluded that the culture in the department was far from conducive to people conducting high quality innovative research. The matter was reported to the institution's Research Office who was able to resolve the situation in consultation with all concerned. However, they recognised the need for formal institutional policies and procedures to improve the culture so that issues such as hyper competition and the pressure to publish were less likely to arise.

Senior administrators agreed that the institution should develop a Research Quality Promotion Plan (RQPP), and they adapted the SOPs4RI Consortium's *Research Integrity Promotion Plan* for this purpose.[80,81,82] The steps they followed included:

- gathering information to identify what change was needed
- assessing the institution's readiness to guide change
- finding the right people to promote and execute the process
- creating and executing a RQPP that addressed hyper competition and publication pressure in the research environment.

Creating and executing a RQPP included:

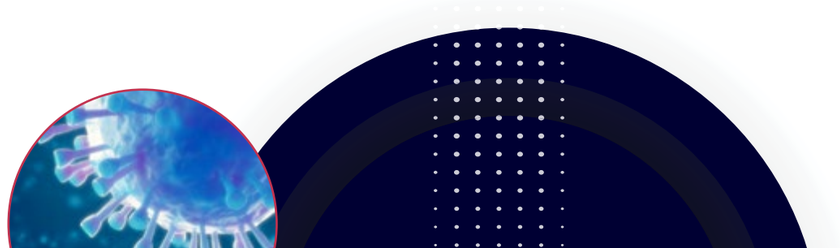
- investigation of the current state of affairs – how the institution was currently addressing problems in the research environment
- investigation of specific areas in need of improvement – hyper competition between researchers and pressure to publish
- development of a future plan – they specified in detail the goal(s); for example, to ensure that early career researchers understood the importance of good data management and conducting research ethically, and that research leaders recognised their responsibility to demonstrate and adhere to good research practices, including positive collaborations. Longer term goals were to reduce the pressure on researchers to publish by rewarding other areas of achievement and to ensure that hiring and promotion practices reflected this. They also specified what actions would be taken, who would be responsible and involved, specific milestones and deadlines, indicators or criteria used for evaluating the effectiveness of the change process, and tools from the SOPs4RI toolbox82 that might support the change process.

After conducting several successful pilot studies in different departments at the institution, as well as monitoring to assess progress and outcomes, their aim was to integrate the changes into the institution's systems more broadly, to help reinforce a collegiate culture conducive to good research practices.

3.6 Communication

3.6.1 Introduction

Transparent and regular communication about good research practices is key to shaping staff and students' values, behaviours, attitudes, expectations and norms within the institution. This can be done through formal channels with all staff and informally within research groups, faculties/schools and through peer networks. Not only do institutions need to ensure that their policies, procedures, standards and expectations about good research practices are publicly available, but that their staff are aware of them, and that they have the guidance and support needed to implement them. Although awareness raising will not bring about cultural change on its own, it will likely contribute to a successful approach.



DESIRED OUTCOMES

- Staff are aware of the institution's policies, procedures, standards and expectations about good research practices
- Information is publicly available about the institution's policies, procedures, standards and expectations about good research practices.

3.6.2 Implementation

Institutions should provide clear, supported pathways for anyone to raise concerns surrounding research quality practices. If in response, institutional leaders focus on rectifying the concerns rather than taking punitive measures, then valuable lessons are more likely to be learned by all those involved.

Internal communication

Institutions should:

- provide detailed **materials, guidance and resources** on good research practices
- ensure that information about the availability and role of **Research Quality Advisors** is readily accessible to all institutional staff and students
- provide clear, easily accessible information about **institutional activities and programs** etc that facilitate good research practices:
  - staff opportunities related to improving research practices; for example education and training (see Section 3.3), mentoring (see Section 3.1), research quality champions (see Section 3.1.3)
  - institutional resources to support the conduct of high-quality research (see Section 3.2)
  - criteria for assessment, appointment and promotion of researchers (see Section 3.4)
  - awards for excellence in research quality (development, design, methodology, conduct and analysis of research) (see Section 3.4)
  - role descriptions and contact details for people who have responsibility for aspects of research culture and research quality.
- ensure materials for **recruitment, promotion and induction** of staff clearly communicate values, expectations, attitudes and cultural norms that support good research practices
- provide clear easily accessible information on the **mechanisms in place to support and protect** people who report issues of concern, for example, the conduct of experiments and interpretation of results
- encourage **communication** between research groups/disciplines/institutions to facilitate exchange of ideas and information about following and improving research practices particularly for multidisciplinary and collaborative research
- provide easily accessible information about the **outcomes of institutional self-reflection exercises** about research quality; for example, analysis of rates of publications of registered studies (such as clinical trials transparency reports provided by TranspariMED), audits of systems.

External communication

Institutional leaders should consider making publicly available, wherever possible, their policies, procedures, guidelines and training materials that affect research practices and research culture, as exemplars of good practice. This could include information about:

- procedures for **management of errors in the public record for research** (for example, correction within a publication, retraction of a publication)
- **disclosure of interests and management of conflicts of interests** during processes for appointment and promotion, by researchers in scholarly publications, and by committee members (for example, members of recruitment and evaluation committees that hire, assess, or promote researchers, curriculum committees that design and/or approve curriculum for degree programs, ethics committees)
- approaches to **education and training** about good research practices
- criteria for **assessment, appointment, and promotion** of researchers (see Section 3.4)
- **awards** for excellence in research quality (development, design, methodology, conduct and analysis of research) (see Section 3.4)
- the institution's **commitment to** implementing internationally recognised principles that promote **responsible research assessment**, such as DORA[73], Leiden Manifesto[83] and Hong Kong Principles[62], including the key steps being taken by institutional leaders to embed the principles
- **community involvement** in research (setting research priorities, ethics review, citizen science etc.)
- **role descriptions and contact details** for people who have responsibility for aspects of research culture and research quality, and how people outside the institution can raise a concern about research quality.

Self-reflection questions

The following sample self-reflection questions could be used as prompts for institutional leaders to assess their current communications about good research practices.

SAMPLE SELF-REFLECTION QUESTIONS

- What sort of materials, guidance and resources on good research practices does the institution provide to the staff and students?
- How do institutional leaders encourage communication between research groups/ disciplines/institutions to facilitate exchange of ideas and information about following and improving research practices, particularly for multidisciplinary and collaborative research?
- How are reports about analysis of matters related to research quality within the institution disseminated to all those within the institution?
- What is the institution's commitment to implementing internationally recognised principles that promote responsible research assessment?
- To what degree does the institution make policies, procedures, guidelines and training materials that affect research practices and research culture publicly available as exemplars of good practice?

3.6.3 Case studies and scenarios

CASE STUDY: OPENNESS OF ANIMAL RESEARCH

There are many misconceptions surrounding animal research due to the historic culture of secrecy and the misleading nature of some communications. Internationally, public dialogues have shown that people are supportive of more open and transparent communications on the use of animals in research.[84] In order to address this, members of the life sciences sector in the United Kingdom (UK) developed the *Concordat on Openness on Animal Research in the UK*, which commits signatories to enhance their communications on animal research, providing more and better information to the public. The Concordat was launched in 2014 and now has 128 signatories, including universities, medical research charities, commercial companies, research councils and funders, umbrella bodies and learned societies from across the UK life science sector. Following a review of the Concordat in 2017, signatories noted the following impacts of the Concordat on the life-sciences research sector:

- Better public access to information about animals in research, directly from those who do the research
- A greater understanding and appreciation of the role of animal care staff, both in and outside the sector
- Increased profile of animal facilities within their establishments, leading to greater investment and better animal welfare
- Better access to see inside animal facilities (for those interested in this work)
- Fewer reactive communications on the use of animals in research, due to more information proactively placed in the public domain.[85]

Since 2014, several countries have developed, or are developing, openness agreements based on similar commitments to those in the UK Concordat (for example, New Zealand, Belgium, France, Germany, Portugal, Netherlands, Spain, Switzerland and the United States of America.[86,87] The development of *Openness Agreement on Animal Research and Teaching in Australia* was completed in 2023, and NHMRC is a supporter of this agreement.[88]

CASE STUDY: USING A RESEARCH QUALITY PROMOTION PLAN TO IMPROVE COMMUNICATION

The head of a research institution was becoming frustrated and concerned over the rising number of complaints and disputes being reported to them from research staff. An analysis of the issues being reported showed that the majority fell into one of the following categories: misunderstandings between scientific collaborators; complaints over the handling of conflicts of interest; disputes over academic authorship; and how best to engage with the public. Clearly, these were all issues of miscommunication between the parties involved, which could be improved if better procedures were put in place to optimise communication.

During a meeting with senior research leaders and senior administrators to discuss the best way forward, the Research Quality Officer made a strong case for adapting the SOPs4RI consortium's Research Integrity Promotion Plan to become a Research Quality Promotion Plan

(RQPP), which could be used to develop policies and procedures for making communications on these issues more transparent and in the process promote good research practices. This approach was supported, and the Office of Research Quality was given responsibility for designing an RQPP for each of the identified categories.

The plans for each comprised:

- a description of the current situation, including the policies and procedures already in place and how effective they are
- areas in need of improvement
- a detailed plan for future activities.

The plan for future activities involved:

- specifying the change-related goals
- employee participation and agreement on a shared outcome of the change
- description of the institutional set-up for implementing the envisioned change
- finding the right tools in the SOPs4RI toolbox[82] that match the goals
- specifying actions to be taken by specific people
- a set of indicators or targets to be used for evaluating the effectiveness of the change process.

The outcome was that sound policies and procedures were put in place for the institution's researchers to conduct effective and transparent collaborations with international and/or non-academic partners, including industry. Similarly, clear policies and procedures were put in place for institutional staff when providing transparent declarations of interest, and processes were documented to ensure that any conflicts of interest arising would be handled appropriately. Research staff were also obliged to respect the new guidelines for authorship and the guidelines for ensuring openness and clarity when engaging with the public. The policies and procedures were communicated regularly to all institutional staff via internal staff communications and newsletters and were made available on the institution's internal and external websites.

CASE STUDY: USING THE OPEN SCIENCE FRAMEWORK TO KEEP TRACK OF YOUR LAB WORK

After realising that data in his laboratory was getting misplaced or lost as a result of general forgetfulness, computers breaking down, staff or students leaving, or organisational strategies breaking down, and that this was probably happening in other laboratories, Brian Nosek and his graduate student Jeff Spies created the Open Science Framework (OSF).[89] The aim of the OSF was to prevent the loss of research material, while creating incentives for preservation and transparency. It is a free open-source web application that helps individuals and research teams organise, archive, document and share their research materials and data. Project leaders create an OSF project and add members, who have a shared space for accessing everything connected to the project. This might include study materials, analysis scripts and data, as well as a wiki, and attached files, submissions to institutional review boards, notes about research goals, posters, lab presentations or pre-prints. Because each action is logged and version histories of the wikis and files kept, the history of the research process is recoverable, and materials are not lost. This means that the work is more easily reproduced either by themselves or by others.

Research groups can choose to make their scripts, code and data available to the public, enabling others to reproduce their analyses and findings or reanalyse the data for their own purposes. To encourage such transparency of findings, Nosek and Spies built in incentives such as statistics documenting the number of project views and files downloads for public projects, and a novel citation type called a 'fork' that registers when others are using and extending your research outputs. As Nosek says, without openness and reproducibility in the scientific process, we are forced to rely on the credibility of the person making the claim, which is not how it should be. The evidence supporting the claim needs to be available for evaluation by others, hence the need to help create a research culture that is open and transparent.

3.7 Monitoring, evaluation and reporting

3.7.1 Introduction

Monitoring, evaluation and reporting about implementation of the elements in this Guide will allow institutions to identify strengths and weaknesses, areas for improvement and potential issues; to track progress; and to measure positive changes.

Many institutions already have processes and initiatives in place to support the conduct of high-quality research and continually improve research culture. As approaches, policies and processes may vary between institutions, this Guide allows for flexibility in its application. Flexibility is also required when it comes to evaluation. That said, institutions should have processes in place to monitor, evaluate and report on their progress in implementing the elements outlined in this Guide; ensure that this progress is reviewed over time; and ensure that recommendations on how to improve progress are implemented.

Culture change may be slow. Consequently, monitoring, evaluation and reporting efforts need to be planned for and supported in the long term. This requires an enduring institutional commitment to both culture change and evaluation.

DESIRED OUTCOMES

Institutions have processes in place to:

- monitor, evaluate and report on their progress in implementing the elements outlined in this Guide
- regularly review this progress over time
- implement recommendations on how to improve progress.

3.7.2 Implementation

Before any action is taken to change culture, baseline measurements of key aspects of culture are required so that progress may be measured against them. To determine what should be measured, a monitoring framework must first be developed.

In addition, an individual or group within the institution should be identified who is responsible for making recommendations about the allocation of resources for monitoring and evaluation, receiving reports of the outcomes of evaluation, directing the implementation of the monitoring and evaluation framework, and making the required changes based on the outcomes from evaluation activities.

Monitoring framework

The Values and Elements outlined in this Guide provide a structure for a monitoring framework. That is, the monitoring framework could capture data relating to the key values (see Table 8) or data relating to each of the five elements identified as contributing to an institution's research working environment (see Table 9):

Table 8. Capturing institutional data related to the key value

Value	Example
Care, collegiality and respect	Data on sustainability and environmental impact
Collaboration	Data on the amount of multi- and trans-disciplinary work
Equity, diversity, inclusion, and respect for others	Data on the diversity of staff and students
Integrity and ethics	Data on the preregistration of research
Intellectual freedom and autonomy	Data on staff and student attitudes to the intellectual climate within the institution
Openness and transparency	Data on open access publications and the rate and amount of data sharing

Table 9 Capturing data related to the elements of the institution's research working environment

Element	Example
Modelling and leadership	Data on supervision and the activities of research quality champions
Education and training about good research practices for all research career stages	Data on the amount of multi- and trans-disciplinary work that is occurring within the institution
Rewards and recognition	Data on the numbers and types of awards relevant to research quality that are being provided within the institution, and/or that are received by staff and students from external organisations
Reporting and addressing research quality issues	Data on the numbers of and types of reports being made relevant to research quality, and the numbers and types of actions being undertaken to address research quality issues
Communication	Data on staff awareness of the institution's policies, procedures, standards and expectations about good research practices
Institutional resources to support the conduct of high-quality research	Data on the numbers and types of institutional resources available to support high-quality research

Where relevant, measurements may be categorised using the culture and behaviour change framework (i.e. whether a particular measurement relates to making change possible, easy, normative, rewarding and/or required).

As noted in the Introduction, the ultimate intended outcomes of this Guide are:

- The culture in NHMRC-funded institutions is open, honest and respectful and provides a supportive environment conducive to the conduct of high-quality research.
- The quality of NHMRC-funded research is strengthened and enhanced to realise the maximum value from the research investment and public funds, to progress scientific knowledge and to contribute to practical and clinical applications, and evidence-based policy.
- Initiatives that promote research quality are rewarded and recognised.

These are the ultimate 'impacts' that implementation of the advice contained within this Guide should seek to realise. Institutional evaluation efforts should therefore ultimately be aimed at improving progress towards each of these outcomes.

The ability to collect particular types of information will vary between institutions, as will the ability to implement particular aspects of culture change. Consequently, institutions should consider a range of factors when establishing and evaluating against a monitoring framework, including:

- What types of **measurement** are feasible within the institution?
- What types of **data** are already being collected (directly, or available via a proxy measurement)?
- What would **progress** look like with respect to each measurement (for example is progress demonstrated by 'more is better', or are there minimum threshold values that must be exceeded)?
- How **frequently** will data collection for and reporting within the framework take place?
- Does improving performance against some measurements have **priority** for the institution?
- What **institutional resources** are available to be used to improve performance, and how will reporting against the framework be linked to the allocation of these resources?

Where institutions already possess an evaluation unit, staff within the unit should be consulted about how best to establish a monitoring framework.

For those institutions that lack a central evaluation function, many resources are available online that might be of assistance. Section 4.2.9 includes information about resources and toolkits provided by the Commonwealth and state governments, and the Global Evaluation Initiative.

Self-reflection questions

The following sample self-reflection questions could be used as prompts for institutions to determine their implementation of a framework for evaluation, monitoring and reporting.

SAMPLE SELF-REFLECTION QUESTIONS

- What processes does the institution have in place to monitor, evaluate and report on the progress in implementing each of the elements outlined in the Guide?
- Who within the institution is responsible for making recommendations about allocation of resources for monitoring and evaluation, receiving reports of the outcomes of evaluation, directing implementation of the monitoring and evaluation framework, and making changes required as a consequence of the evaluation activities?
- How will the institution ensure that progress is reviewed regularly?
- What are the institution's long-term commitments to conducting monitoring, evaluation and reporting efforts?

3.7.3 Case studies and scenarios

CASE STUDY: HOW TO EVALUATE EDUCATION AND TRAINING ABOUT GOOD RESEARCH PRACTICES

As McGee (2014) describes, there are various ways of evaluating a course on the responsible conduct of research, which range from taking student attendance to assessing their attitudinal changes.[90] The strategy outlined in this paper could be applied to the evaluation of the education and training element in this Guide.

McGee advises that you need to decide whether you are going to evaluate the effectiveness of the course delivery or assess actual learning and/or change. The simplest forms of evaluation are paper or online surveys whose questions often focus on program mechanics, delivery by presenters and completion of required activities. They don't tell us whether any learning has actually occurred and whether behaviours will change as a result of the education and training. In contrast to quantitative evaluation questions, qualitative evaluation questions require written responses and take more time and effort from the respondent. However, they can provide useful information on, for example, how the discussions and readings were received. Since there are significant benefits to be gained from determining whether any learning is taking place, McGee suggests that it may be worthwhile collecting standardised data over several years to look for a cumulative effect, which is known as summative or outcome evaluation. When formulating questions to assess what has been learned, McGee advises categorising the types of learning that can take place into the following: knowledge, skills, attitudes, and behaviours, and possibly beliefs, and then carefully specifying exactly what you hope will be learned from each session, under each of these categories. It is important that these learning goals are designed to be measurable. McGee acknowledges that it is particularly difficult to measure impact on people's behaviours and suggests formulating questions that ask about their anticipated future behaviours. With carefully designed questions, it should be possible to obtain useful feedback on how participants are receiving and processing the information presented, and this can then be used to continually improve the teaching process.

CASE STUDY: WAYS FOR INSTITUTIONS TO MONITOR RESEARCH PRACTICES

The National Institutes of Health requires formal training and support for practices and activities that enhance research rigour and reproducibility. As a result, institutions in the US have been prompted to examine whether their training programs adequately cover rigour and reproducibility and whether faculty have adopted such practices. Stanford University has a program dedicated to research rigour and reproducibility, known as SPORR, part of which is dedicated to developing resources and tools to support monitoring and accountability.[91] In 2022 Stanford University conducted a survey of 62 US universities and medical research institutions in 31 states to collect information on the current state of rigour and reproducibility education, training, monitoring and support. Australian institutions planning to monitor their initiatives designed to improve research quality, which includes activities to enhance rigour and reproducibility, could adapt the SPORR program to their situation, and conduct surveys and focus group interviews of researchers to ascertain their data sharing and management practices; analyse to what degree the researchers share protocol, code and data; monitor the publication and reporting of ethics review committee approved research at their institution, and survey the publication status of clinical trials from their institution.

4 Resources and references

4.1 International initiatives and activities

Some examples of relevant international initiatives and activities are as follows:

- In the UK, reports have been produced by several organisations including the Royal Society[10,92], the Wellcome Trust[93], the Russell Group[94] and the Nuffield Council for Bioethics.[95] These reports have informed the UK Government's *Research and development people and culture strategy*, published in 2021.[96] This strategy sets out initial actions in three priority areas – people, culture and talent.
- UK Research and Innovation's (UKRI) approach to supporting a healthy research and innovation culture encompasses actions on open research; bullying and harassment; research integrity; research and innovation culture; equality, diversity and inclusion; and preventing harm in research and innovation.[97] UKRI's approach in the area of research innovation and culture is multifaceted and incudes reflecting on its own systems and processes, how these influence the wider system, and improving its understanding of how it can support the whole research and innovation community to create environments that support a positive culture.
- Science Europe produced a Statement on Research Culture – Empowering Researchers with a Thriving Research System (2021), which focusses on the quality of research and its processes, supports scientific freedom, and promotes social diversity and inclusion, acknowledging that these conditions will, in turn, foster a productive research system.[98]
- In 2022, Science Europe launched a *Values framework for the organisation of research* as a guide to foster a forward-looking research culture within the European Research Area and globally.[99] Values include autonomy/freedom; care and collegiality; collaboration; equality, diversity and inclusion; integrity and ethics; and openness and transparency.
- The National Institutes of Health (USA) is implementing recommendations from a working group report on changing the culture to end sexual harassment in scientific research settings, which was published in 2019.[100]
- The University of Cambridge Data Champion program.[34]
- Reproducibility and Research Integrity (2023). UK Parliament House of Commons Committee Report.[101]

4.2 Resources

The webpage links for these resources are current at the time of publication.

4.2.1 Values

Topic	URL
National Health and Medical Research Council, *Australian code for the care and use of animals for scientific purposes, 2013 (updated 2021)*, Commonwealth of Australia, Canberra.	https://nhmrc.gov.au/about-us/publications/ australian-code-care-and-use-animals-scientific-purposes
National Health and Medical Research Council, Australian Research Council and Universities Australia. *Australian Code for the Responsible Conduct of Research, 2018*. Commonwealth of Australia, Canberra.	https://www.nhmrc.gov.au/about-us/ publications/ australian-code-responsible-conduct-research-2018
National Health and Medical Research Council, Australian Research Council and Universities Australia. *National Statement on ethical conduct in human research, 2023*. Commonwealth of Australia, Canberra.	www.nhmrc.gov. au/nationalstatement
Science Europe. *A values framework for the organisation of research*	https://scienceeurope.org/our-priorities/research-culture/ research-values-framework/

4.2.2 Modelling and leadership

Topic	URL
Anderson, W.P. 'Trust in Medical Research: what scientists must do to enhance it' (2023), Monash University. Monograph	https://bridges.monash.edu/articles/monograph/Trust_ in_Medical_Research_What_Scientists_Must_Do_to_ Enhance_It/23827920

Topic	URL
Bulat, A., 'The UCL Good Supervision Guide: A guide for new and experienced supervisors', University College London, (2018)	https://www.ucl.ac.uk/teaching-learning/sites/teaching-learning/files/ucl_good_supervision_guide_2018-19_screen.pdf
Farkas A.H., Bonifacino E., Turner R., Tilstra S.A., Corbelli J.A. 'Mentorship of Women in Academic Medicine: a Systematic Review'. *J Gen Intern Med*. (2019) Jul;34(7):1322-1329,	https://pubmed.ncbi.nlm.nih.gov/31037545/ doi: 10.1007/s11606-019-04955-2. PMID: 31037545; PMCID: PMC6614283
SOPs4RI consortium, 'Guidelines for research institutions on supervision and mentoring', Online version 1 (2021).	https://doi.org/10.17605/OSF.IO/E2BSJ
The Royal Society, 'Integrity in practice toolkit'	https://royalsociety.org/-/media/policy/projects/research-culture-images/integrity-in-practice-september-2018.pdf?la=en-GB&hash=3DB24C1B799FACD3962911BF146B2A57
The Spanish National Research Council (CSIC), Research integrity and good scientific practices, 'CSIC's Code of scientific good practises'	https://www.csic.es/en/csic/scientific-integrity-and-ethics-csic/scientific-integrity-and-good-practises
UKRIO UK Research Integrity Office, 'Research Integrity Champions, Leads & Advisers'	*https://ukrio.org/ukrio-resources/publications/research-integrity-champions-leads-advisers/*

4.2.3 Education and training in good research practices

Topic	URL
ARRIVE guidelines- a checklist of recommendations to improve the reporting of research involving animals	https://arriveguidelines.org/
Australian Council of Graduate Research, Good Practice Guidelines, 'Good Practice Framework for Research Training' (2012)	https://www.acgr.edu.au/good-practice/best-practice/
Equator Network – provides links to reporting guidelines for the main study types	https://www.equator-network.org/reporting-guidelines/

Topic	URL
European Commission, Directorate-General for Environment, 'Caring for animals aiming for better science', Directive 2010/63/EU on protection of animals used for scientific purposes: education and training framework. Publications Office (2018)	Cahttps://op.europa.eu/en/publication-detail/-/publication/fca9ae7f-2554-11e9-8d04-01aa75ed71a1/language-enring for animals aiming for better science - Publications Office of the EU (europa.eu)

4.2.4 Institutional resources to support the conduct of high quality research

Topic	URL
SOPs4RI Consortium, 'Research Integrity tools for RPOs'	https://sops4ri.eu/tools/
Stanford Medicine. Stanford Program on Research Rigor & Responsibility,	https://med.stanford.edu/sporrnford Program on Research Rigor and Reproducibility | Stanford Program on Research Rigor & Reproducibility | Stanford Medicine
UK Parliament, 'Reproducibility and research integrity: Sixth report of session 2022–23'	https://publications.parliament.uk/pa/cm5803/cmselect/cmsctech/101/report.html
University of Glasgow: Research Culture	https://www.gla.ac.uk/myglasgow/ris/researchculture/

4.2.5 Aboriginal and Torres Strait Islander researchers

Topic	URL
CARE Principles for Indigenous Data Governance	https://www.gida-global.org/care
Close the Gap Foundation. 'Cohort-Based Learning' Cohort -Based Learning emphasises collaboration, inclusivity, and group discussion within a group of students or individuals.	https://www.closethegapfoundation.org/glossary/cohort-based-learning

Topic	URL
Ewen S, Ryan, T, and Platania-Phung, C. (2020) 'It wasn't just the academic stuff, it was life stuff': the significance of peers in strengthening the Indigenous health researcher workforce. *The Australian Journal of Indigenous Education* 49: 135–144.	https://doi.org/10.1017/jie.2020.14
Ewen, S., Ryan, T., and Platania-Phung, C. (2019) 'Further strengthening research capabilities: a review and analysis of the Aboriginal and Torres Strait Islander health researcher workforce'. The Lowitja Institute, Melbourne.	https://www.lowitja.org.au/page/services/resources/health-services-and-workforce/workforce/further-strengthening-research-capabilities-summary-report-2018
NHMRC Workshop report: Strengthening and growing capacity and capability of Aboriginal and Torres Strait Islander health researchers Melbourne University Business School, 16–17th May 2018	https://www.nhmrc.gov.au/health-advice/aboriginal-and-torres-strait-islander-health/building-and-strengthening-capacity-indigenous-health-researchers
Policy Brief: August 2020 We are working for our people: Growing and strengthening the Aboriginal and Torres Strait Islander health workforce: The Career Pathways Project. The Lowitja Institute. Vic	https://www.lowitja.org.au/content/Image/Career_Pathways_Policy_Brief_Working_for_Our_People_2020.pdfple_2020.pdf (lowitja.org.au)
Universities Australia, 'Indigenous Strategy 2022–25'	Ethics And Research Integrity - UA-Indigenous-Strategy-2022-25.pdf - All Documents (sharepoint.com)

4.2.6 Rewards and recognition

Topic	URL
Centre for Open Science (2022) 'Watch the supporting open science in the promotion & tenure process: lessons from the University of Maryland webinar'	https://www.cos.io/blog/open-science-promotion-and-tenure-process-webinar
Coalition for Advancing Research Assessment: CoARA	https://coara.eu/
DORA, 'San Francisco Declaration on Research Assessment'	https://sfdora.org/read/
DORA, 'SPACE to evolve academic assessment: A rubric for analyzing institutional conditions and progress indicators'	https://sfdora.org/resource/space-to-evolve-academic-assessment-a-rubric-for-analyzing-institutional-conditions-and-progress-indicators/
DORA, 'Tools to Advance Research Assessment (TARA)	https://sfdora.org/project-tara/
DORA, Resource Library	https://sfdora.org/resource-library
European Commission, 'Einstein Foundation Award for Promoting Quality in Research' (2022)	https://euraxess.ec.europa.eu/worldwide/asean/einstein-foundation-award-promoting-quality-research#:~:text=The%20Einstein%20Foundation%20Award%20for,and%20stimulate%20awareness%20and%20activities
European Commission. Open Research Europe. 'Reforming research assessment: what does it mean for Open Research Europe?' (2022)	https://open-research-europe.ec.europa.eu/blog/reforming-research-assessment
Hicks, D., Wouters, P., Waltman, L. et al. 'Bibliometrics: The Leiden Manifesto for research metrics', Nature, 520, 429–431 (2015).	https://doi.org/10.1038/520429a https://www.nature.com/articles/520429a

Topic	URL
Moher, D., Bouler, L., Kleinert, S., Glasziou, P., Sham, M.H., Barbour, V., Coriat, A.-M., Foeger, N. and Dimagl, U. 'The Hong Kong Principles for assessing researchers: Fostering research integrity' PLOS Biology, (2020),	https://journals.plos.org/plosbiology/ article?id=10.1371/journal.pbio.3000737
Science Europe (2022) 'The Agreement on Reforming Research Assessment'	https://scienceeurope.org/news/rra-agreement-final/
Science Europe. (2020), 'Position Statement and Recommendations on Research Assessment Processes', doi: 10.5281/ZENODO.4916155	https://scienceeurope.org/news/rra-agreement-final/
UK Reproducibility Network, (2021) 'UKRN Statement on rewards and Incentives for Open Research'.	https://osf.io/v5jrm/F Preprints | UKRN Statement on Rewards and Incentives for Open Research
UNESCO Recommendation on Open Science. (2023)	https://www.unesco.org/en/open-science/about#:~:text=The%20UNESCO%20Recommendation%20on%20Open%20Science%20provides%20an%20international%20framework,divides%20between%20and%20within%20countries.Science | UNESCO
University of Maryland, Department of Psychology. Departmental Policies and Initiatives	https://psyc.umd.edu/about-us/department-policies-and-initiatives
Wellcome Trust, 'Guidance for research organisations on how to implement responsible and fair approaches for research assessment'	https://wellcome.org/grant-funding/guidance/open-access-guidance/research-organisations-how-implement-responsible-and-fair-approaches-research

4.2.7 Reporting and addressing research quality issues

Topic	URL
QUEST Center for Responsible Research.	https://www.bihealth.org/en/translation/innovation-enabler/quest-center/mission-approaches
SOPs4RI Consortium, 'Toolbox for Research Integrity'	https://sops4ri.eu/toolbox/

4.2.8 Communications

Topic	URL
Concordat on Openness on animal research in the UK	https://concordatopenness.org.uk/
SOPs4RI Consortium, 'Toolbox for Research Integrity'	https://sops4ri.eu/toolbox/
Wellcome Trust, 'Guidance for research organisations on how to implement responsible and fair approaches for research assessment'	https://wellcome.org/grant-funding/guidance/open-access-guidance/research-organisations-how-implement-responsible-and-fair-approaches-research

4.2.9 Monitoring, evaluation and reporting

Topic	URL
Australian Government- The Treasury. Australian Centre for Evaluation and Evaluation toolkit	https://evaluation.treasury.gov.au/
Better Evaluation, a part of the Global Evaluation Initiative, provides many useful resources	https://www.betterevaluation.org/
Stanford Medicine. Stanford Program on Research Rigor & Responsibility'	https://med.stanford.edu/sporrnford Program on Research Rigor and Reproducibility | Stanford Program on Research Rigor & Reproducibility | Stanford Medicine
Stanford University, Stanford Data Science, 'Center for Open and Reproducible Science'	https://datascience.stanford.edu/cores
Stanford: Stanford Center for Reproducible Neuroscience	https://reproducibility.stanford.edu/Neuroscience
State government resources, for example, the NSW Government: Evaluation resource hub	https://education.nsw.gov.au/teaching-and-learning/professional-learning/pl-resources/evaluation-resource-hub

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5 Process Report

The objectives of NHMRC's Research Quality Strategy include supporting a research culture conducive to the conduct of high-quality research. To achieve this objective, NHMRC's Research Quality Steering Committee (RQSC) has overseen the development of the Good Institutional Practice Guide (the Guide). The Guide has been developed in consultation with the RQSC Good Institutional Practice Guide Working Group. The RQSC was established under section 39 of the *National Health and Medical Research Council Act 1992*.

5.1 Key steps in the process

The process for the development of the draft Guide included:

- establishment of the Good Institutional Practice Guide Working Group as a RQSC subcommittee
- development of an outline of the Guide for consideration by the RQSC and NHMRC's Research Committee
- development of the full content of the draft Guide in consultation with the Working Group
- consultation with NHMRC's Indigenous Advisor and a representative of NHMRC's Principal Committee Indigenous Caucus to ensure that the draft Guide adequately covers issues faced by Aboriginal and Torres Strait Islander researchers and provides sufficient information about how to implement cultural change so that these issues are addressed
- finalisation of the draft Guide for consultation by the Working Group and the RQSC
- consideration of the draft Guide by Research Committee
- consultation about the draft Guide by the health and medical research sector
- ***(Note: Information about additional steps in the process will be included following consultation about the draft Guide and prior to finalisation of the Guide.)***

Disclosure of interest and management of conflicts of interest were managed in accordance with the requirements of the National Health and Medical Research Council Act 1992.

5.2 Commitee membership

5.2.1 Research Quality Steering Committee

- Professor Paul Glasziou AO (Chair). Director, Centre for Research in Evidence Based Practice, Faculty of Health Sciences and Medicine, Bond University
- Professor Virginia Barbour. Adjunct Professor, Faculty of Health, School of Public Health and Social Work, Queensland University of Technology. Director, Open Access Australasia. Editor-in-Chief, Medical Journal of Australia
- Professor Adrian Barnett. Statistician, School of Public Health and Social Work, Faculty of Health, Queensland University of Technology
- Dr Emma Beckett. Lecturer, School of Environmental and Life Sciences, University of Newcastle
- Dr Glenn Begley. International BioTechnology Consultant

- Professor Stacy Carter. Director, Australian Centre for Health Engagement, Evidence and Values (ACHEEV), University of Wollongong
- Professor Julie McMullen. Head, Cardiac Hypertrophy Laboratory, Baker Heart and Diabetes Institute

5.2.2 Good Institutional Practice Guide Working Group

The Working Group is a subcommittee of the Research Quality Steering Committee.

- Dr Glenn Begley (Chair). International BioTechnology Consultant
- Professor Adrian Barnett. Statistician, School of Public Health and Social Work, Faculty of Health, Queensland University of Technology
- Dr Emma Beckett. Lecturer, School of Environmental and Life Sciences, University of Newcastle
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