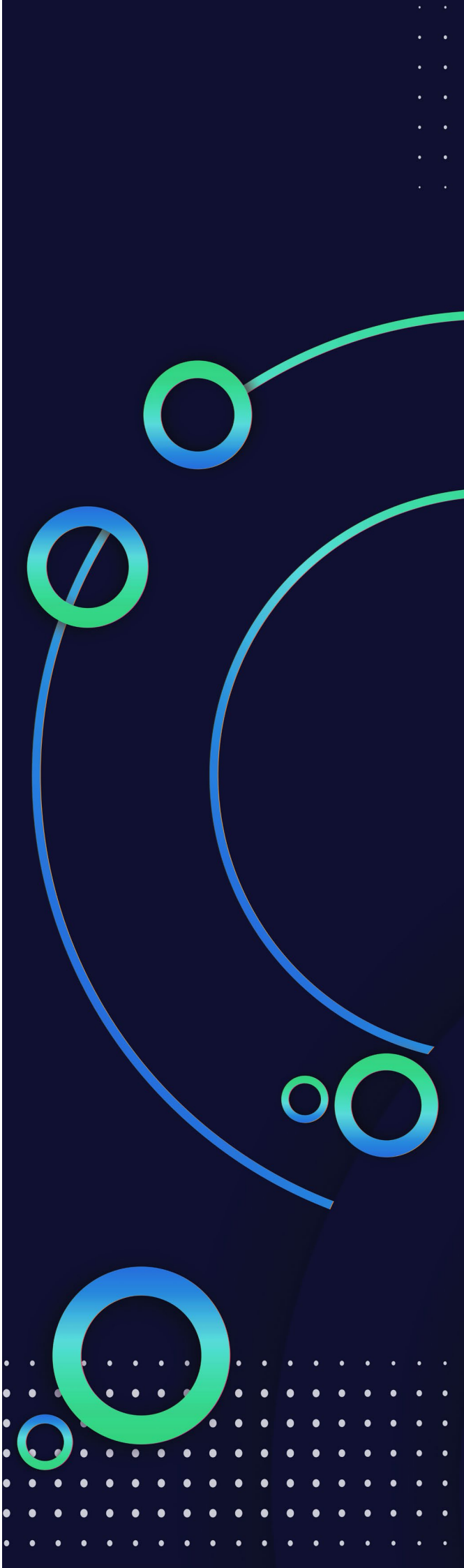
Australian Government

National Health and Medical Research Council

NHMRC Good Institutional Practice Guide

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

2025



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User guide

The *Good Institutional Practice Guide* (the Guide) is designed as a resource for institutional and research leaders (hereafter referred to as leaders) seeking to promote an open, honest, supportive and respectful institutional research culture that supports the conduct of high-quality research. The Guide aligns with a key objective of NHMRC's Research Quality Strategy.[1]

Whilst focused on providing guidance for leaders, everyone involved in a sector contributes to its culture. As such, this Guide may be of interest to all those responsible for, or involved with, the conduct, administration and oversight of research. This includes researchers, undergraduate and postgraduate research students, staff involved with research ethics, staff involved with research governance, research administration staff, and research support staff (for example, librarians, information technology professionals, data stewards, core facility staff).

Suggested activities in the Guide give practical expression to the values underpinning an open, honest, supportive and respectful research culture and are grouped according to seven key elements of research culture. Embedding these changes is intended to foster an institutional research culture in which researchers feel supported to conduct high-quality research. The Guide also provides self-reflection questions that leaders can use as prompts to determine their stage of implementation. Case studies and scenarios demonstrate how some institutions have achieved positive cultural change.

NHMRC recognises that many institutions already have processes and initiatives in place to support the conduct of high-quality research and to improve research culture. The Guide has been designed as a resource for leaders, and all sector participants, as they work collaboratively to implement cultural change.

The intended outcomes from the Guide are:

- Institutional and research leaders are supported to strengthen their research culture.
- The quality of research is enhanced so as to maximise value from the investment of public funds.
- Initiatives that improve research quality are recognised and rewarded.

Scope

This Guide is focused on how leaders can promote and facilitate the conduct of high-quality research by fostering an open, honest, supportive and respectful institutional research culture.

The Guide does not provide guidance about specific research practices or fields of research.

Behaviours such as research misconduct and poor interpersonal behaviour, such as bullying and harassment, are critical issues that affect research culture. However, strategies and guidance for managing these behaviours lie outside the scope of this document.

- The management of research integrity matters and research misconduct is addressed under NHMRC's existing framework of policies and guidelines.[2]
- The management of personal and interpersonal issues is addressed in relevant legislation and institutional human resources policies and guidelines.

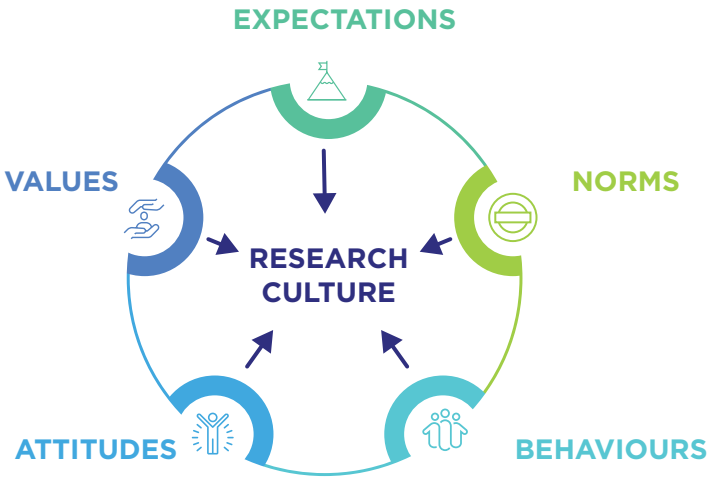
Structure of this Guide

- Section 1 describes values that underpin an institutional research culture that is conducive to the conduct of high-quality research.
- Section 2 outlines elements of institutional research culture that shape the research working environment.
- Section 3 presents information about the approach used in this Guide for achieving improvements in institutional research culture.
- Section 4 outlines suggested activities that can be used by leaders to strengthen their institutional research culture.
- Section 5 provides definitions and abbreviations used in the Guide.
- Section 6 provides information about relevant international initiatives, useful resources and references.

Introduction

Research culture

Research culture encompasses the behaviours, attitudes, values, expectations and norms of research communities.[3,4]



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.[4] An open, honest, supportive and respectful research culture has been shown to result in increased researcher satisfaction and wellbeing at work, enhanced performance, capability development and better researcher retention[5]. Researchers are more likely to thrive and produce high-quality research when their institution has a positive work environment and culture.

Recent surveys of the Australian research sector highlighted concerns about education and training in responsible research practices, research integrity, mentorship, unhealthy competition, publishing pressures, promotion assessment processes, funding/costs, job insecurity, and questionable research practices.[6,7,8,9] Early- and mid-career researchers (EMCRs) reported that job insecurity, short-term contracts and the pressure to obtain external funding are having a negative effect on their wellbeing, with 56.5% classified as having high stress and 54.3% experiencing work-related burnout.[10] These concerns are not unique to the Australian sector.[11,12,13,14] 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 (**Section 6.1**).

The research ecosystem encompasses government departments, funding agencies, research institutions, journals and publishers. While institutions have an influential role in the research ecosystem, they are not the sole drivers of research culture and practices. A range of economic, political, social and cultural factors can work together to create pressures and incentives that influence the research environment and research practices. Comprehensive cultural change requires a collaborative effort by all members of the research ecosystem to align values, incentives and policies. This Guide is intended to provide guidance for one part of the ecosystem – leaders in research institutions seeking to promote a research culture that is conducive to the conduct of high-quality research.

High-quality research

Research quality refers to the way the research is planned, performed and reported, as well as to the methodology, rigour and judgement applied to all aspects of the process.[15]

High-quality research is rigorous, transparent and reproducible, and:

- 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.[1]

Examples of responsible research practices that contribute to high-quality research

Note: This list is not exhaustive, and an example may be relevant to only a specific type of research.

- **Consumer and community involvement:** actively work with consumer and community representatives so that they help shape decisions about research priorities, and are involved in all stages, levels and types of research.
- **Establishment of research question:** consider the evidence base (for example, literature reviews, systematic reviews, qualitative systematic reviews, scoping reviews); include input from the people who will ultimately benefit from the research; interdisciplinary collaboration.
- **Study design:** consider sex, gender, variations of sex characteristics and sexual orientation as appropriate; implement good statistical design and appropriate sampling strategies; prepare for all types of missing data; consider safety and/or welfare risks to study participants, workers, animals or the environment; report during the planning stage (for example, pre-registration, registered report, statistical analysis plan, data management plan).
- **Study conduct:** use appropriate qualitative and/or quantitative methods, blinding during sample/data collection; randomisation; keep adequate records; good data management and storage.
- **Analysis:** use blinding during data analysis, reduce bias in analysis and interpretation of results; conduct appropriate statistical analysis.
- **Reporting and dissemination:** disseminate research findings responsibly, accurately and broadly; complete reporting including methodology, data and findings; open access publication and when relevant, align with the principles for Indigenous data governance; report negative/neutral results; share results with research participants and stakeholders.

National research framework

Australia's framework for responsible and ethical research conduct is underpinned by three national standards:

- Australian Code for the Responsible Conduct of Research[16] (the Code)
- National Statement on Ethical Conduct in Human Research[17]
- Australian code for the care and use of animals for scientific purposes.[18]

Together these standards provide guidance on responsible and ethical research conduct across all research disciplines, with the Code establishing the overarching framework. This framework also includes a range of supporting policies and guides focused on specific cohorts and specific issues to support responsible and high-quality research conduct. For example:

- Ethical conduct in research with Aboriginal and Torres Strait Islander Peoples and communities[19] and Keeping research on track II[20]
- Statement on consumer and community involvement in health and medical research[21]
- Statement on Sex, Gender, Variations of Sex Characteristics and Sexual Orientation in Health and Medical Research[22]
- Best practice methodology in the use of animals for scientific purposes.[23]

1. Values

The values that underpin an institution's research culture serve as a guide for all those responsible for, or involved with, the conduct, administration and oversight of research. They influence people's attitudes and actions, encourage them to work towards common goals and help them to maintain consistent standards.

This section describes values that support an open, honest, supportive and respectful research culture that is conducive to the conduct of high-quality research.

Many institutions will already have a set of values that underpin their culture. Leaders are encouraged to consider how the values outlined in this Guide align with, or might strengthen, their existing institutional values and how they may be applied to the institution's research culture.

1.1 Care

Care for self and others 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. For senior researchers, it also means effectively and compassionately mentoring and supporting research students and EMCRs as well as making the research work environment psychologically and physically safe for all members of their teams.

Members of the research community should care for colleagues, research participants and themselves, for animals in research and for the environment; and take responsibility for establishing and maintaining collegiality.

1.2 Collaboration

Collaboration and working cooperatively encourages the debate of new ideas, the incorporation of multiple perspectives into the research effort, and an increase in the transparency and openness of research processes.

Members of the research community should embrace collaboration within and between teams, academic disciplines (inter- and trans-disciplinary) and institutions; as well as with the community and relevant education, policy and industry sectors.

1.3 Ethics and integrity

Behaving ethically and with integrity is more than simply doing the right thing. It involves acting with an abiding respect and concern for one's research colleagues, research participants, the wider community, animals and the environment. It also involves actions to maintain and improve reliability, honesty, respect, and accountability in the research domain.

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.

1.4 Intellectual freedom

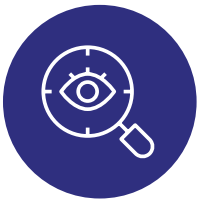
Intellectual freedom is supported when the research culture values free expression of ideas and the open exchange of opinions.

Researchers should be free to explore and express ideas in a supportive research environment. They should also be encouraged and supported to participate in open scientific debate and critique as it can serve to strengthen the research effort.

1.5 Respect for others

Respect for others is a fundamental ethical value. A respectful research culture 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, their cultural heritage, experience, and perspective.

Members of the research community should seek opportunities to enhance workforce equity, diversity and inclusion, making research environments accessible and accommodating to all, including people with different abilities and lived experience, ancestry, preferred language, faith, sex, gender, sexual orientation, and socioeconomic status.



1.6 Transparency

Transparency in research occurs when research findings, supporting data and enabling methodologies are shared and communicated openly, responsibly and accurately.[24]

Transparency in research makes research processes more efficient, productive and reliable, and increases the public's trust in research processes and findings. It also helps to address global and local inequalities by extending the reach of the research benefit and assisting under-resourced researchers.

Members of the research community should ensure that all aspects of research are transparent.

2. Elements that shape research culture

This section builds on the values outlined in **Section 1** that support an open, honest, supportive and respectful research culture. The key elements identified as being integral to shaping research culture, and the desired outcomes from implementation of this Guide for each element, are outlined in **Table 1.**

Table 1. Key elements that shape research culture

Element	Description	Desired outcomes
Role modelling and leadership	Modelling of behaviour that is positive and values based, and promotes reflection, collegiality and responsible research practice including open science.	Leaders model positive behaviours, attitudes, values and expectations, including: • caring for researchers and all research team members • encouraging collaboration, equity and sustainability of research career paths • fostering and supporting the careers of research students and EMCRs.
Institutional resources	Allocation of resources to support the conduct of high-quality research.	Leaders provide adequate support, or access to appropriate external support, for conducting high-quality research. Such support includes: • expert and technical advice • methodological input and support • administrative support • material resources.
Education and training	Provision of effective and continuing education and training of researchers about responsible research practices.	• Leaders support and promote effective and continuing education and training of researchers about responsible research practices. • Researchers have the knowledge and skills essential for the conduct of high-quality research. • Leaders value time spent on education and training about responsible research practices.

Element	Description	Desired outcomes
Rewards and recognition	Reward and recognition of practices and activities that maximise the quality of research.	• Criteria for assessment of researchers (for example hiring, promotion, rewards and recognition) include the recognition of efforts that promote a positive research culture, and measures that recognise the diversity of research activities, practices and outputs that maximise the quality of research. • Criteria and evaluation processes for assessment, rewards and recognition are transparent. • Individuals and groups in administrative and support units who make positive contributions to an open, honest, supportive and respectful research culture are recognised and rewarded.
Communication	Availability and support for implementation of institutional policies and procedures about research culture and responsible research practices.	• Staff are aware of, and understand, how the institution's policies and procedures help to shape a research culture that is conducive to the conduct of high-quality research. • Information is publicly available about the institution's policies and procedures relevant to research culture and responsible research practices.
Monitoring, evaluation and reporting	Processes to monitor, evaluate and report on progress in implementing the activities suggested in this Guide.	Institutions have processes in place to: • monitor, evaluate and report on their progress in implementing the suggested activities outlined in this Guide • regularly review this progress over time • Implement recommendations on how to improve progress.

3. Implementing cultural change

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. This Guide has been designed to allow leaders to take a flexible approach to implementing the suggested activities to promote an open, honest, supportive and respectful institutional research culture.

It will depend upon an institution's circumstances as to whether leaders choose to implement some or all of the suggested activities.

There are many and varied approaches that leaders can and do take to bring about cultural change'.[25] This Guide focuses on one of the available options – the 'Strategy for culture and behaviour change'. The strategy describes five levels at which actions can be taken in a progressive manner, reflecting the fact that successful implementation of higher levels depends on successful implementation of lower levels (see **Figure 1**).

1 Provision of basic infrastructure, including tools and skills, makes the desired change 'possible'.

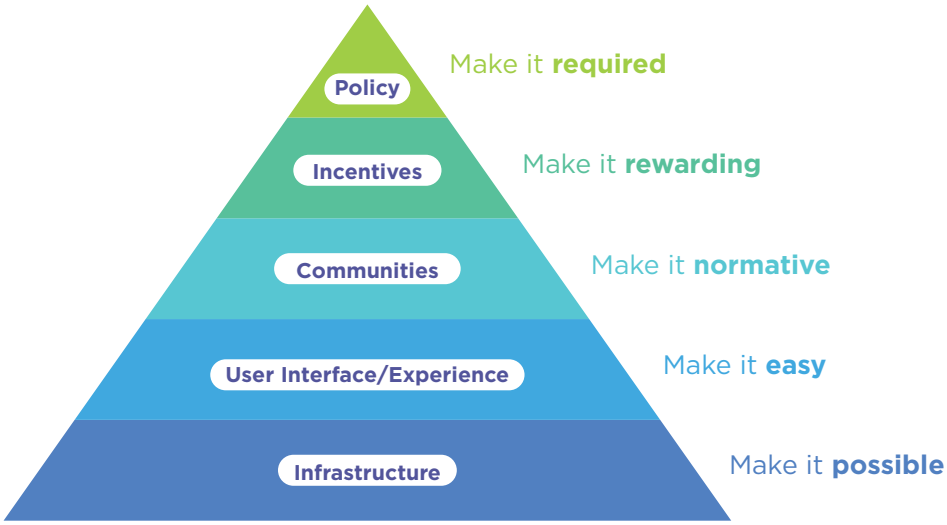
2 Ensuring that this infrastructure is user-friendly makes it 'easy' for the research community to adopt the desired change.

3 Once the desired change is recommended and accepted by (a large part of) the research community, its adoption may be considered 'normative'.

4 Incentives may be introduced to make adoption of the desired change 'rewarding'.

5 Implementation of the desired changes is made 'required' through the development and adoption of relevant institutional policies.[25]

Figure 1. Strategy for culture and behaviour change[25]



By providing practical guidance in the form of suggested activities for each of the five levels of action, this Guide focuses on incremental, values-aligned changes that can be made within institutions. Embedding these changes is intended to foster a research culture in which researchers will feel supported to conduct high-quality research.

It is important to recognise that cultural change takes time and can be achieved with gradual improvements. It can involve a continuous process, implemented along different time frames for different elements of the research culture. Each element can be gradually and progressively improved through a continuous process of self-assessment, planning, implementing, monitoring and evaluating.

3.1 Examples

Samples of graded implementation activities, based on those suggested in this Guide, are outlined in **Table 2** and **Table 3**. An example of how the values outlined in **Section 1** can be given practical expression by implementation of the suggested activities in this Guide is provided in **Table 4**.

Table 2. Sample: Graded implementation activities – Leadership, supervision and mentorship (see Section 4.1)

Intervention type	Activities: Leadership, supervision and mentorship
Make it **possible**	Identify training needs in research leadership, supervision and mentorship, to determine where efforts should be focused.
Make it **easy**	Ensure training in leadership, supervision and mentorship is open to a wide and diverse range of staff and held at times convenient to those with out-of-work responsibilities.
Make it **normative**	Make the qualities and characteristics of good leaders, supervisors and mentors a regular topic for discussion at meetings (for example, research group meetings, faculty meetings) and in communications from leaders.
Make it **rewarding**	Include evidence of supervision and mentorship skills as part of promotion and institutional award processes.
Make it **required**	Include requirements for training in leadership, supervision and mentorship in institutional policies.

Table 3. Sample: Graded implementation activities – Open science

Intervention type	Activities: Open science
Make it **possible** 	Provide infrastructure for supporting open science, 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[26] • tools for transparent record keeping, for example, Electronic Laboratory Notebooks.
Make it **easy** 	• Appoint qualified librarians to advise and support researchers across a range of topics including the scholarly information lifecycle, research metrics, open science practices and data management.
Make it **normative** 	• Research leaders to provide an example to other researchers by using institutional resources that support open science practices; for example repository infrastructure, data storage infrastructure and tools for transparent record keeping.
Make it **rewarding** 	• 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.
Make it **required** 	• Require research data and code to be made FAIR[26] and, when relevant, to align with the CARE principles for Indigenous data governance[27] requiring an 'open as possible, closed as necessary' approach. • Mandate the use of tools for transparent record keeping and require these records to remain openly available in accordance with open science practice.[28]

Table 4. Example: Practical expression of values

Value	Activities (see Section 4)
Care	Establish communities of practice within and between institutions and facilitate regular meetings/social gatherings for peer support.
Collaboration	Recognise the contribution of research students and EMCRs in collaborative and team research.
Ethics and integrity	Create an environment where ethical and responsible research practices are the norm, for example by holding regular discussions about improving research practices. Take effective, swift and positive actions when questionable research practices first occur, and support those who identify and seek advice about potential questionable research practices.
Intellectual freedom	Create a supportive and encouraging environment where everyone can speak freely about the team's research activities and data, including its strengths and weaknesses.
Respect for others	Consult with researchers belonging to underrepresented groups, such as people with a disability, people who are culturally and linguistically diverse, neurodiverse, and/or LGBTQIA+ about their needs from their supervisors and mentors.
Transparency	Develop incentives for staff to take advantage of centrally provided services, for example, repositories for publications.

Safe working environment

Institutions must create a culturally safe working environment for Aboriginal and Torres Strait Islander researchers to thrive and produce high-quality research.[29]

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.

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

- Develop a Reconciliation Action Plan (RAP) in collaboration with Reconciliation Australia to turn good intentions into real actions.[30,31]
- Provide a safe environment with overarching Aboriginal and Torres Strait Islander peoples' governance processes, safe and inclusive recruitment processes, and representation at executive and senior leadership levels.
- Establish Indigenous-led governance of Aboriginal and Torres Strait Islander peoples' research.
- Allow Indigenous knowledge practices and non-Indigenous knowledge practices to complement each other.
- Establish and embed practices at the institution that demonstrate respect for Aboriginal and Torres Strait Islander peoples and observe cultural protocols throughout the year, not just during commemorative events (for example, by holding smoking ceremonies and by flying the Aboriginal and Torres Strait Islander flags).
- Foster collaboration among all researchers by holding workshops, seminars, masterclasses, and other less structured forums where people can interact and grow together.
- Prioritise and invest in cultural capability training for all staff.

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

CASE STUDIES: Two different approaches to achieving institutional cultural change

At the **University of Glasgow**, research culture is part of a multi-disciplinary team focused on creating a positive research culture by promoting collegiality, career development, research recognition, open research and research integrity.[32] The objectives, activities and measures of progress are comprehensively described in their *Institutional strategic priorities for research culture 2020-2025* plan.[33] To date, they have:

- established a Research Culture Commons which people can join and contribute to cultural 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 6 diverse initiatives focusing on developing leadership in research and researchers as leaders.

The **Stanford Program on Research Rigor and Reproducibility (SPORR)**, run by Stanford Medicine, has a variety of initiatives in place and others in the pipeline to support a culture of research rigor and reproducibility (R&R).[34] Their initiatives are aimed at faculty, staff, graduate and postgraduate students and fellows, and 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.

4. Implementation

This section builds on the values outlined in **Section 1** that support an open, honest, supportive and respectful research culture conducive to the conduct of high-quality research. It provides practical guidance in the form of suggested activities for each of the elements outlined in **Section 2**, to assist leaders to translate and embed the values into cultural norms within an institution and achieve continuous improvement. Sample self-reflection questions can be used by leaders as prompts to assess their institution's research culture and determine their stage of implementation of cultural change. Case studies based on real-world examples, and hypothetical scenarios, outline examples of how some institutions have achieved positive change in their research culture.

4.1 Role modelling and leadership

Desired outcomes

Leaders model positive behaviours, attitudes, values and expectations, including caring for researchers and all research team members, encouraging collaboration, equity and sustainability of research career paths, and fostering and supporting the careers of research students and EMCRs.

4.1.1 Introduction

Traditionally, health and medical researchers are perceived as strong and successful leaders if they oversee a large team of staff, have many PhD students, and have a continuous flow of publications in high impact journals.

This guide seeks to reinforce a different version of what makes a good leader in research: one who promotes a vision for the future that is positive and values-based, and promotes reflection, collegiality and responsible research practices, including open science.

When a leader exemplifies and reinforces the institution's core values, they help to create a culture that reflects these values and inspire staff to behave and act accordingly. A good research leader, with institutional support as appropriate:

- actively seeks to develop and broaden their team's talent and skills
- recognises the contributions and achievements of all members of their team, including those from diverse backgrounds and disciplines
- values the team's diverse outputs, impacts, practices and activities that maximise the quality and rigour of research
- creates a supportive and encouraging environment where everyone can speak freely about the team's research activities and data, including its strengths and weaknesses
- effectively addresses concerns such as unhealthy competition, publication pressure, detrimental power imbalances and conflicts
- is honest and open about their decisions and mistakes
- practices humility and is open to alternative views
- ensures the equitable and transparent distribution of resources for which they are responsible

- reinforces an environment where ethical and responsible research practices are the norm including through regular discussions about improving research practices; taking effective, swift and positive action when questionable research practices first occur; and supporting those who identify and seek advice about potential questionable research practices
- models self-care and demonstrates that high-quality research does not need to be associated with excessive or burdensome workloads
- facilitates succession planning by supporting the development of leadership skills in research students and EMCRs.

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 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. Leaders should actively promote supervisory best practice, acknowledging and, as appropriate, rewarding genuine excellence in supervision.[35] The *Australian Code for the Responsible Conduct of Research* outlines that institutions have a responsibility to ensure supervisors of research trainees have the appropriate skills, qualifications and resources.[16]

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.

A good supervisor, with institutional support as appropriate:

- serves as a role model to less experienced researchers
- maintains a high degree of professionalism and current knowledge of their field or discipline
- reflects on their own competence to provide advice and to seek objective feedback and support where necessary.
- reflects the behaviours of good leadership
- initiates regular discussions about responsible research practices
- facilitates and supports access to ongoing learning opportunities
- creates a respectful research environment where scientific critique is encouraged
- acknowledges the work performed by others and recognises their contributions in a rigorous and fair manner, especially with respect to authorship of publications and on funding applications
- develops their own knowledge and skills in communication with, and management of, staff.

72% of respondents agreed that mentoring programs that address research quality and career development are amongst the most significant institutional interventions to improve research quality. *NHMRC sector survey.*[6]

A mentorship program can help facilitate a positive research culture for mentees by providing:

- encouragement and a second opinion
- assistance with managing their work pressures
- connections to relevant institutional and external support services and resources
- help to expand their networks of useful contacts
- ideas about what skills and achievements should be valued
- input and feedback on responsible research practices at all stages of the research cycle
- support regarding career opportunities.

4.1.2 Implementation

Implementation of better support systems for researchers (in particular, research students and EMCRs, and researchers experiencing difficulties such as vicarious trauma as a result of working on sensitive topics), encouragement of interdisciplinary 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 research leaders, supervisors and mentors. Suggestions for how leaders can help their staff to do this are provided in **Table 5**.

Table 5. Graded implementation: Role modelling and leadership

Phase	Suggested activities
Make it **possible** 	• Identify **training needs** in research leadership, supervision and mentorship, to determine where training efforts should be focussed. • Support the **career development** of future generations of leaders by providing research students and EMCRs with opportunities to discuss and explore their own research ideas. • Ensure that leaders understand the importance of including **diverse perspectives** during the creation of knowledge, in order to challenge inequity and address social needs. • Consult with staff and students about implementing **mentorship programs.** • Consult with **Aboriginal and Torres Strait Islander researchers and students** about their needs from their supervisors and mentors, both Indigenous and non-Indigenous. • Consult with researchers from underrepresented groups, such as those who identify as culturally and linguistically diverse, neurodiverse or LGBTQIA+, about their needs from their supervisors and mentors. • 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. • Consult with staff and students to understand what support systems leaders can put in place.

Phase	Suggested activities
Make it **easy** 	• Ensure **training** in leadership, supervision and mentorship is open to a wide and diverse 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 all non-Indigenous supervisors and mentors receive training in **cultural competence and cultural safety**. • Provide easy access to staff with expertise in **responsible research practices** (for example, librarians).
Make it **normative** 	• Make the **qualities and characteristics** of good leaders, supervisors and mentors **a regular topic for discussion** at meetings (for example, research group meetings, faculty meetings) and in communications from 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 peoples-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. • **Socialise examples** of best practice via communications both internally and externally (for example, newsletter articles). • Ensure **modelling** by leaders through their active support for leadership/supervisor training and mentoring programs and that they undergo relevant training themselves. • Provide **opportunities** for and encourage research students and EMCRs, including Aboriginal and Torres Strait Islander researchers, to take on leadership roles.
Make it **rewarding** 	• Establish institutional/faculty/school **awards** for staff who **model** exemplary leadership/mentor/supervisory values and behaviours. • **Recognise** supervision and/or mentorship of students in staff workload. • Include evidence of supervision and mentorship skills as part of **promotion and institutional award processes**. • Establish a system for **recognising staff** who demonstrate excellence in the provision of training in supervision and mentorship. • Include evidence of supervision and mentorship skills as part of placement/hiring, promotion and institutional award processes.
Make it **required** 	• Include requirements for training in leadership, supervision and mentorship in **institutional policies**. • Provide clarity about **institutional expectations** for leadership, supervision and mentorship in institutional policies, procedures and communications within the institution. • Where appropriate, make leadership, supervision and mentorship skills a key performance indicator (**KPI) during performance appraisals and promotions**. For senior staff, an additional KPI could be the leadership, supervision and mentorship skills of the staff they manage.

Aboriginal and Torres Strait Islander Peoples' 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. They 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.[36]

4.1.3 Self-reflection questions

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

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?
- How many staff undergo training in leadership, supervision and mentorship and to what cohorts do they belong?
- How often are the qualities and characteristics of good leaders, supervisors and mentors discussed at meetings (for example, research group meetings, faculty meetings) and in communications from leaders?
- How does the institution reward staff who display exemplary leadership values and behaviours?
- How is the institution's requirement that its leaders model positive behaviours, attitudes, values and expectations assessed and reflected in institutional policies?
- How does the institution provide a safe environment where issues about leaders/supervisors/mentors can be raised at an early stage?
- How are leaders supporting the use of peer generative power by Aboriginal and Torres Strait Islander researchers?
- How are leaders supporting and investing in Aboriginal and Torres Strait Islander peoples' research leadership?

4.1.4 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 research leaders in the department to talk about how they could give research quality more focus. The result was the *Research Quality Champions*, a networking group in which early career researchers could discuss research quality and responsible research practices. 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*,[16] and the University of Cambridge's Data Champion program.[37]

A pilot for the *Research Quality Champions* network was actively supported by leaders. The Champions organised training, by internal and external experts, about research quality and responsible research practices. They 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 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 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.

4.2 Institutional resources

Desired outcomes

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.

4.2.1 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, the provision of rewards and recognition, and interdisciplinary research collaborations, require resource allocation.

4.2.2 Implementation

Leaders should aim to provide sufficient resources to facilitate the conduct of high-quality research and researchers' use of responsible research practices. Suggestions for the graded implementation of institutional resources to support the conduct of high-quality research are provided in **Table 6.**

Table 6. Graded implementation: Institutional resources to support the conduct of high-quality research

Phase	Suggested activities
Make it **possible** 	• **Identify and gather information on responsible** research practices. • Examine faculty/school and institutional policies relevant to the conduct of responsible research practices and determine where extra **resources** are needed to put policies into practice. • Simplify and harmonise policies to ensure clear and consistent messaging to researchers. • Appoint, train and support **people to provide advice to all institutional staff** on matters relating to research quality. • **Hire staff** with relevant expertise in responsible research practices and/or **train existing staff** to become experts in responsible research practices. Provide **infrastructure** for supporting responsible research practices, such as: – appropriate library services to provide access to a curated collection of information resources and evidence-based information collections – 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 the FAIR[26] principles and the CARE principles for Indigenous data governance[27] – tools for transparent record keeping, for example, Electronic Laboratory Notebooks. • Establish **communities of practice** (within and between institutions) to discuss responsible research practices and ways to support high-quality research. • Establish an **Aboriginal and Torres Strait Islander peoples-led researcher network** to support early and mid-career researchers and to forge closer connections between students and Aboriginal and Torres Strait Islander academics. • Establish Indigenous-led governance of Aboriginal and Torres Strait Islander peoples' research.
Make it **easy** 	• Set aside **funding** for quality improvement practices. • Gather **data and evidence** on what policies work at your institution. • **Suppor**t centres and standard frameworks for specific types of research (for example, clinical trials, Indigenous research). • Support provision of expert advice to institutional committees such as Human Research Ethics Committees and Animal Ethics Committees. Provide **easy access** to: – staff with **expertise** in responsible research practices (for example, statistical advice; librarians, veterinary advice for animal research, legal and financial teams) for provision of advice at all stages of the research cycle – **infrastructure** for supporting responsible research practices – **independent peer review** (internal or external) of research plans and publications – **information** about responsible research practices (for example, website, intranet, internal communications, training). • Support and facilitate **opportunities for collaboration** across the institution and between disciplines to support responsible research practices (for example, through a community of practice). • Support Aboriginal and Torres Strait Islander students and researchers to form **peer networks**.

Phase	Suggested activities
Make it **normative** 	Leaders to **provide an example** to other researchers by: – using institutional resources that support responsible research practices – promoting the use of statistical support and research collaborations, including interdisciplinary collaboration – supporting **communities of practice** (within and between institutions) for discussing responsible research practices. • Include the institutional resources that are available to support 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 responsible research practices in internal communications. • Leaders to **maintain awareness** of the latest research on research quality. • Support and encourage staff to attend, and present to, **conferences** on research 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 who come together to produce peer generative power.
Make it **rewarding** 	• Include expertise in responsible research practices as a criterion for **staff performance review**. • Recognise the **time** contributed by staff who provide support/training for, and advice about, the conduct of high-quality research and responsible research practices. • Recognise staff who give up their time to serve on committees. • 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. • Appropriately **acknowledge** staff who provide 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.
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.[38] • Require management and stewardship of research data and code to accord with the **FAIR principles**[26] and, when relevant, the **CARE principles** for Indigenous data governance[27] requiring an 'open as possible closed as necessary' approach. • Mandate the use of tools for **transparent record keeping** and require records to remain openly available in accordance with **open science practice**.[28]

Communities of practice

Institutions are encouraged to share resources and infrastructure with each other by forming cross-institutional communities of practice to:

- discuss responsible research practices
- share resources for the design and provision of training in leadership, supervision and mentoring
- share resources for education and training of researchers in responsible research practices
- provide professional statistical support for all researchers
- share repository and data storage infrastructure for open access to research outputs and data
- discuss better ways to support individuals who report people for using questionable research practices
- implement and embed internationally recognised principles that promote responsible research assessment
- establish a formal feedback loop where institutions can share their experiences and challenges with implementing the Guide, possibly with a dedicated online platform, regular surveys and workshops.

4.2.3 Self-reflection questions

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

Sample self-reflection questions

- How have institutional policies and procedures been modified to support a positive research culture and responsible research practices?
- How do leaders encourage the use of infrastructure for supporting the conduct of high-quality research?
- How does the institution ensure that all researchers have access to support services as needed (for example, statistical advice, library services)?
- 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 Aboriginal and Torres Strait Islander peoples' 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?

4.2.4 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 trials at European universities had reported their results, Karolinksa Institute (KI) decided to address this issue at their own institution.[39,40] 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. Responsibility for the registration and reporting of clinical trials/studies was centralised to its existing research support unit and two additional full-time staff were hired 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 them with advice and tips.

CASE STUDY: 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.[41,42] 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 and supporting the Australian Reproducibility Network, which has been recently established based on the UKRN.[43]

SCENARIO: Appointment of a biostatistician to the Health Research Ethics Committee

The Chair of an Australian 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 is more likely to lead to useful outcomes.

4.3 Education and training about responsible research practices

Desired outcomes

- Leaders support and promote effective and continuing education and training of researchers about responsible research practices.
- Researchers have the knowledge and skills essential for the conduct of high-quality research.
- Leaders value time spent on education and training about responsible research practices.

4.3.1 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 responsible research practices, it is internationally recognised that there is a need for greater consistency in the content and delivery of education and training programs for researchers and assessment of knowledge and skills attained.

72% of respondents indicated that provision of education, training and supervision was a key feature of the research environment that encouraged the production of high-quality research. *NHMRC sector survey.*[6]

Effective and continuing education and training about responsible research practices equips researchers with the necessary knowledge and skills to conduct high-quality research. It also ensures that researchers have a common understanding about the requirements and expectations for the conduct of research throughout their research career.

4.3.2 Implementation

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

- regular assessment and evaluation of the education and training needs of members of the institutional research community
- recognition that participation in education and training does not necessarily equate to attainment of knowledge or skills
- mechanisms for assessment of knowledge and skills attained by a suitably 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 education and training in addition to formal lectures/tutorials and the traditional 'master-apprentice' model used for PhD training, with the attainment of some skills better suited to education via supervision
- the variety in the timing of delivery so that necessary knowledge and skills are maintained, and new ones 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.

Suggestions for the graded implementation of education and training of researchers about responsible research practices are provided in **Table 7**.

Table 7. Graded implementation: Education and training of researchers

Phase	Suggested activities
Make it **possible** 	• **Assess** education and training needs of students and researchers to identify where to focus efforts.[44] • 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. • **Establish** a staff member whose responsibilities include the administration and coordination of the education and training of researchers. • Ensure leaders actively **support** education and training programs and provide researchers with sufficient time to attend relevant education and training.
Make it **easy** 	• Provide clear information about **processes** for obtaining required knowledge and skills. 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).[45,46] – 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; upon recruitment; regular refresher; 'advanced' programs for senior researchers; ongoing during conduct of particular activities. • Provide a process for **recognition of prior learning** (for example, for experienced researchers prior to being required to undertake 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. • **Evaluate the effectiveness** of the education and training programs and modify as required.

Phase	Suggested activities
Make it **normative** 	• Make education and training related to responsible research practices a regular/ standing topic for **discussion** at research group meetings and in communications from leaders. • Remind staff and students of the **institution's expectations** about the attainment of knowledge and skills, 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 responsible research practices 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 peoples'-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 leaders **attain relevant** knowledge and skills themselves.
Make it **rewarding** 	• Include relevant education, training and attainment of relevant knowledge and skills in staff workload and **promotion criteria**. • Establish a system for **recognition** within research groups of knowledge skills that have been attained 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.
Make it **required** 	• Include the requirements for and attainment of relevant knowledge and skills 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 relevant knowledge and skills in **institutional policies**. • Provide clarity about **institutional expectations** in policies, procedures and communications. • Require **compulsory education and training** and attainment of knowledge and skills about responsible research practices for all research career stages. • Make relevant education and training and attainment of knowledge and skills 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 knowledge and skills attained. • **Verify** whether the education and training programs provided are helping staff attain core knowledge and skills for the conduct of high-quality research.

4.3.3 Self-reflection questions

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

Sample self-reflection questions

- What kinds of support and resources are provided for all modes of delivery of education and training (for example, expert, technical and administrative support, infrastructure, material resources, list of recommended training/tools)?
- How are the different modes of delivery used to ensure that the training is accessible, suitable, practical, engaging, relevant, implementable and meets the individual's needs?
- How does the institution encourage and facilitate peer support for education and training about responsible 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 responsible research practices are included in institutional policies?
- How does your institution measure and check attainment of relevant knowledge and skills?

4.3.4 Case studies and scenarios

CASE STUDY: Improving experimental design through education and training

With the support of senior management, the Baker Heart and Diabetes Institute undertook an exercise to encourage preclinical researchers to improve the quality of their cardiac and metabolic animal studies.[47] 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,[48] 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.[46]

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 responsible research practices are deeply embedded.

4.4 Rewards and recognition

Desired outcomes

- Criteria for assessment of researchers (for example hiring, promotion, rewards and recognition) include the recognition of efforts that promote a positive research culture, and measures that recognise the diversity of research activities, practices and outputs that maximise the quality of research.
- Criteria and evaluation processes for assessment, rewards and recognition are transparent.
- Individuals and groups in administrative and support units who make positive contributions to an open, honest, supportive and respectful research culture are recognised and rewarded.

4.4.1 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.[8,49,50,51,52] The current assessment of researchers usually 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 strongly on past performance thereby missing the opportunity to consider a researcher's potential, 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.[8,49]

44% of respondents 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. *NHMRC sector survey*.[6]

A positive research culture is supported by assessment practices that recognise collaboration, openness, engagement with society, and the diversity of activities, outputs and outcomes that maximise the quality and impact of research, while providing opportunities for diverse talents.[8]

By rewarding and recognising activities and behaviours that support such a culture, leaders can play an important role in encouraging and reinforcing those activities and behaviours, which ultimately contribute to the conduct of high-quality research.

Assessment practices that contribute to a positive research culture also include the recognition of researchers' workloads that are beyond their formal roles or employment arrangements such as membership of committees, contributions to broader institutional and community activities and organising conferences. In addition, they include the recognition of diverse perspectives from underrepresented groups such as Aboriginal and Torres Strait Islander researchers, people with disability and LGBTQIA+ researchers in academia, all of whom suffer from lack of representation in senior leadership positions.[8] Without role models at higher levels, researchers belonging to minority groups may feel uncertain about promotion criteria and are less inclined to pursue career advancement. Marginalised individuals face the added burden of having to advocate for their rights, assert their place in research, often struggle to fit into the traditional academic mould, and are often called upon to advocate for their community.[8] Aboriginal and Torres Strait Islander researchers are frequently asked to take on workloads beyond their formal roles or employment arrangements, for example, contribute to specific events institution-wide, connect Aboriginal and Torres Strait Islander peoples' and communities with institutions, become committee members, run cultural awareness training for staff and students, be a representative at events (for example, NAIDOC event), revise and review Aboriginal employment plans and Reconciliation Action Plans. All of these activities are time consuming and are rarely appropriately remunerated or recognised in assessment metrics or as part of recruitment approaches.[53]

EMCRs and diversity groups have indicated a need for enhanced transparency in how institutions incorporate research assessment into promotion criteria, recruitment processes and career progression.[8]

Promotion committees with a diverse makeup are more likely to respond with empathy and understanding towards marginalised individuals. The creation of specific career pathways and clear guidelines can support people with diverse needs seeking to progress their careers.[8,10]

4.4.2 Implementation

Rewarding and recognising positive contributions to the institutional research culture and the use of responsible research practices can be achieved through formal processes such as appointments, promotions and awards, and through informal processes such as peer recognition. Suggested activities to achieve gradual improvements in these areas are highlighted in **Table 8**.

Table 8. Graded implementation: Rewards and recognition

Phase	Suggested activities
Make it **possible** 	• In consultation with the institutional research community, **assess** processes and criteria for the following, and identify areas for improvement: – rewards and recognition for responsible 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[54] and the Hong Kong Principles[50] may assist leaders to identify where they might focus activities for improvement. • Seek **regular input from staff and student**s about criteria for assessment of researchers for hiring and promotion, including criteria that make allowances for career disruption and recognise achievement relative to opportunity.
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 accessible guidance:** – about assessment of researchers for hiring and promotion – about **membership of appointment and promotion committees**, including a diversity of membership – 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[51] – to **support people with diverse needs** seeking to progress their career. • Provide **support** to staff involved with hiring and promotion; for example, providing examples of questions that can be asked in interviews that focus on responsible research practices.
Make it **normative** 	• Progressively implement criteria relevant to research quality in **hiring and promotion** guidance 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 and responsible research practices and how these are relevant to performance and promotion criteria. • Regularly **recognise** responsible research practices at research group meetings, for example: – positive role modelling and good leadership behaviours by leaders – responsible research practices and behaviours by researchers.

Phase	Suggested activities
Make it **rewarding** 	• Provide **public acknowledgement** (for example, at faculty/school meetings) of a research group or an administrative or support unit who are championing a positive research culture and high-quality research. • 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 excellence **awards** for: – mentoring, research training and supervision with award criteria based on the quality of mentoring/training/supervision rather than metrics such as the number of students supervised – researchers who demonstrate behaviours that foster high-quality research such as promoting the use of responsible research practices and collaborative and interdisciplinary research[55,56,57] – administrative and support units (for example, library, information technology, statistical support, Research Office) that promote and/or support responsible research practices. • When hiring, reviewing and promoting researchers, recognise those who demonstrate and implement responsible research practices. • Recognise and reward individuals for their **contributions to the research environment beyond their formal roles**. • Recognise and reward **Aboriginal and Torres Strait Islander researchers** for their **contributions to the broader institutional culture**.
Make it **required** 	• **Commit to (**and formally sign where appropriate) **internationally recognised principles/declarations** that promote responsible research assessment (for example, DORA[58], CoARA[59], the Leiden Manifesto[60], the Hong Kong Principles[50]). Provide information about the key steps being taken by leaders to implement the principles. • Include **assessment criteria** relevant to research quality in formal institutional policies for hiring and promotion. • Where appropriate, include responsible research practices and contributions to a positive research culture as KPIs **during performance appraisals and promotions**. • Make **public statements** on rewards and recognition (for example, those produced by the United Kingdom Reproducibility Network[61,62]). • **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 simple metrics such as impact factors.

4.4.3 Self-reflection questions

The following sample self-reflection questions could be used as prompts for leaders to determine their stage of implementation as outlined in **Table 8**.

Sample self-reflection questions

- What criteria does the institution have for rewarding and recognising responsible 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 leaders informed researchers that hiring and promotion criteria will focus on responsible research practices and hence a diverse range of research outputs and contributions?
- How do the leaders recognise and/or reward examples of behaviours that contribute to a positive research culture, good mentorship and supervision?
- How are administrative and support units recognised and rewarded for positive contributions to the institutional research culture and support for high-quality research?
- What requirements regarding assessment criteria relevant to research quality exist in formal institutional policies for hiring and promotion?

4.4.4 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 responsible research practices, with questions covering practices such as publishing of null results, open data and stakeholder engagement.[63] 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.[64] 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,
- 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
- EMCRs engaging with the framework and proposing forward-looking ideas to improve scientific outcomes
- 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: Rewarding desired behaviours

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[26]
- 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.

4.5 Communication

Desired outcomes

- Staff are aware of and understand how the institution's policies and procedures help to shape a research culture that is conducive to the conduct of high-quality research.
- Information is publicly available about the institution's policies and procedures relevant to research culture and responsible research practices.

4.5.1 Introduction

Transparent and regular communication with all staff and students about institutional policies and procedures is integral to conveying the institution's expectations and shaping research culture. This can be achieved within the institution through formal channels with staff and students, as well as informally within research groups, faculties/schools and through peer networks. Making the institution's policies and procedures publicly available, wherever possible, contributes to sharing of information within the sector. While awareness raising will not bring about cultural change on its own, when staff are provided with the guidance and support to implement policies and procedures, it makes an important contribution.

4.5.2 Implementation

Suggestions for how leaders can enhance communication about relevant institutional policies and procedures both internally and externally are provided in **Table 9**. It does not include suggestions for how researchers could better communicate with each other or communicate about their research activities.

Table 9. Communication about institutional policies and procedures relevant to research culture

Phase	Suggested activities
Make it **possible** 	• Review relevant institutional policies and procedures to ensure that they align with a research culture that is open, honest, supportive and respectful.
Make it **easy** 	• Encourage **communication between research groups/disciplines/institutions** to facilitate exchange of ideas and information about research culture and high-quality research including for interdisciplinary and collaborative research. • Provide clear, easily accessible detailed **information about responsible research practices**. • **Provide clear, easily accessible information** about relevant institutional activities and programs, for example: – staff opportunities related to education and training about responsible research practices (see **Section 4.3**), mentoring (see **Section 4.1**) – institutional resources to support the conduct of high-quality research (see **Section 4.2**) – criteria for assessment, appointment and promotion of researchers (see **Section 4.4**) – awards for excellence in research quality (development, design, methodology, conduct and analysis of research) (see **Section 4.4**) – role **descriptions and contact details** for people who have responsibility for aspects of research culture and research quality.
Make it **normative** 	• Include research culture and responsible research practices as a **regular item for discussion** during research group and faculty/school meetings. • Establish **communities of practice, within and between institutions,** to facilitate discussion of research culture and responsible research practices. • Provide easily accessible information about the **outcomes of institutional monitoring and evaluation** of activities to foster a positive research culture (see **Section 4.6**). • Ensure **information is publicly available** about the institution's policies and procedures about research culture and responsible research practices.
Make it **rewarding** 	• Recognise staff or students who **give seminars** about following and improving research practices, including for interdisciplinary and collaborative research. • Recognise staff who **develop successful initiatives for communicating** about research culture and responsible research practices within the institution. • Establish institutional awards for **excellence in communication** about research culture and responsible research practices.
Make it **required** 	• Require **information provided for recruitment, promotion and induction of staff** to include clear communication about the institution's policies and procedures that support a positive research culture and responsible research practices. • **Commit to (**and formally sign where appropriate) **internationally recognised principles/declarations** that promote responsible research practices, (for example, DORA[58], Leiden Manifesto[60], Hong Kong Principles[50]) and provide information about the key steps being taken by leaders to embed the principles.

4.5.3 Self-reflection questions

The following sample self-reflection questions could be used as prompts for leaders to determine their stage of implementation as outlined in **Table 9**.

Sample self-reflection questions

- What sort of information and guidance on research culture and responsible research practices does the institution provide to the staff and students?
- How do leaders encourage communication between research groups/disciplines/institutions to facilitate exchange of ideas and information about following and improving research practices, particularly for interdisciplinary 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 practices?
- To what degree does the institution make policies and procedures relevant to research culture and research practices publicly available as exemplars of good practice?

4.5.4 Case studies and scenarios

CASE STUDY: Openness of animal research

To address misconceptions surrounding research involving the use of animals, the *Openness Agreement on Animal Research and Teaching in Australia* was launched in 2023.[65] NHMRC is a supporter of this agreement. Similar openness agreements have been developed for other countries.[66] Internationally, the outcomes from openness agreements include:

- 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.[66]

SCENARIO: Using a research quality promotion plan to improve communication

An analysis of the issues being reported by staff at a research institution showed that the majority related to miscommunication such as misunderstandings between scientific collaborators, and how best to engage with the public. To address these issues, institutional and research leaders agreed that these issues could be improved if better procedures were put in place to optimise communication and collaboration. They supported the development of a research quality promotion plan (RQPP), based on SOPs4RI consortium's research integrity promotion plan,[67] to guide the development of appropriate policies and procedures. The Research Office was given responsibility for designing an RQPP. The plan 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[68] toolbox 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 implementation of sound policies and procedures to guide effective and transparent communication and collaboration between staff. 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

The Open Science Framework (OSF) was created by Brian Nosek and his graduate student, Jeff Spies, with the aim of preventing the loss of research material, while creating incentives for preservation and transparency.[69] It is a free open-source web application that helps individuals and research teams organise, archive, document and share their research materials and data. Information connected to an OSF project 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 the project authors or by others.

The OSF allows research groups 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, the OSF includes 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.'

4.6 Monitoring, evaluation and reporting

Desired outcomes

Institutions have processes in place to:

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

4.6.1 Introduction

Monitoring, evaluation and reporting by institutions about their progress in implementing the suggested activities in this Guide will allow them to identify strengths and weaknesses, areas for improvement and potential issues; to track progress; and to measure positive changes.

Cultural 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 cultural change and evaluation.

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. It is therefore expected that there will be variation in the way that each institution chooses to monitor, evaluate and report on their progress.

For those institutions that lack a unit focused on evaluation, **Section 6.2.9** includes information about useful resources and toolkits provided by the Commonwealth and state governments and the Global Evaluation Initiative.

4.6.2 Implementation

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 (**Table 10**) or data relating to each of the five elements identified as contributing to an institution's research culture (**Table 11**).

Table 10. Capturing institutional data related to the values

Value	Examples
Care	Data on types of distress experienced by researchers. For example, monitor and report on the amount of distress experienced by researchers working on sensitive topics and measure whether there has been a change in the number of reports.
Collaboration	Data on the amount of inter- and trans-disciplinary work. For example, has there been a change in the number of inter- and trans-disciplinary research collaborations within the institution and with other institutions?
Ethics and integrity	Data on the preregistration of research. For example, has there been a change in the number of preregistrations of clinical trials?
Intellectual freedom	Data on staff and student attitudes to the intellectual climate within the institution. For example, are staff satisfied that assessment criteria recognise research(er) potential and innovative ideas as well as past performance and previous outputs?
Respect for others	Data on the diversity of staff and students. For example, has there been a change in the proportion of promotions of staff belonging to underrepresented groups to senior roles (for example, associate professor, professor)?
Transparency	Data on open access publications and the rate and amount of data sharing. For example, has there been a change in the number and variety of your institution's research outputs deposited into a publicly accessible platform (for example, subject-based or institutional repository)?

Table 11. Capturing data related to the elements that shape institutional research culture

Element	Examples
Role modelling and leadership	Data on supervision, and the activities of staff who provide support for the conduct of high-quality research For example, has there been a change in the number of staff completing training in leadership, supervision and mentorship? Has there been a change in the number of staff completing training in cultural competence and cultural safety?
Institutional resources	Data on the numbers and types of institutional resources available to support high-quality research. For example, are more staff taking advantage of centrally provided services such as statistical support, repositories for publications, data storage infrastructure, transparent record keeping and communities of practice?
Education and training about responsible research practices	Data on the numbers and types of staff and students achieving knowledge and skills related to responsible research practices. For example, has there been a change in the proportion of staff in each research area undergoing relevant education and training? Has there been a change in the proportion of staff in each research area achieving relevant knowledge and skills?
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. For example, has there been a change in the number and diversity of awards granted for excellence in quality of the development, design, methodology, conduct and analysis of research?
Communication	Data on staff awareness of the institution's policies and procedures relevant to research culture and responsible research practices. For example, are staff more knowledgeable about the institution's policies and procedures on using open science practices?

Suggestions for how institutions can achieve gradual improvements in the monitoring, evaluation and reporting about their progress in implementing the suggested activities in this Guide are highlighted in **Table 12**.

Table 12. Monitoring, evaluation and reporting

Phase	Suggested activities
Make it **possible** 	• Choose the **evaluator/evaluation team**. • **Identify a person/group to be responsible** for making recommendations about the allocation of resources for monitoring and evaluation, for 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 of evaluation activities. • Before developing a monitoring framework (see **Table 10** and **Table 11** for examples), consider the following factors: – 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 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? • Develop a formal **Terms of Reference** document that outlines the requirements for the evaluation.
Make it **easy** 	• Develop the monitoring and evaluation **framework**. • Develop an evaluation **plan** covering: – purpose of the evaluation – key questions the evaluation is seeking to answer – sources of data that will help answer these questions – tasks, resourcing and timeframes.[70] • **Allocate resources** for monitoring and evaluation. • Identify and develop a process for receiving **reports of the outcomes** of evaluation.
Make it **normative** 	• Develop a **work plan** that sets out the specific activities to implement evaluation, including identification of the reporting requirements and a dissemination plan. • Implement the **process for receiving reports** of the outcomes of evaluation. • Make **baseline measurements** of key aspects of culture according to the chosen framework. • Clarify and document the institution's **long-term commitments** to conducting monitoring, evaluation and reporting. • Develop a **communication plan** to help ensure findings are shared in the most appropriate way with staff and students.

Phase	Suggested activities
Make it **rewarding** 	• **Recognise and reward the person/team** involved in making the required changes based on the outcomes of evaluation activities.
Make it **required** 	• Implement the selected **monitoring and evaluation framework**. • Implement the **required changes** based on the outcomes of evaluation activities. • Commit to the **long-term conduct** of monitoring, evaluation and reporting on key aspects of research culture. • Ensure **transparency of evaluation findings** and their release within the institution.

4.6.3 Self-reflection questions

The following sample self-reflection questions could be used as prompts for leaders to determine their stage of implementation as outlined in **Table 12**.

Sample self-reflection questions

- What processes does the institution have in place to monitor, evaluate and report on the progress in implementing the suggested activities 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, and quality improvement opportunities are applied?
- What are the institution's long-term commitments to conducting monitoring, evaluation and reporting efforts?

4.6.4 Case studies and scenarios

CASE STUDY: How to evaluate education and training about responsible research practices

There are various ways of evaluating a course on the responsible conduct of research, ranging from recording student attendance to assessing their attitudinal changes.

A decision should be made about 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 indicate whether any learning has actually occurred and whether behaviours will change as a result of the education and training. In contrast, 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, it may be worthwhile collecting standardised data over several years to look for a cumulative effect (summative or outcome evaluation).

When formulating questions to assess what has been learned, it is useful to categorise the types of learning that can take place into the following: knowledge, skills, attitudes, and behaviours, and possibly beliefs. Then carefully specify the intended learning outcomes from each session under each of these categories. It is important that these learning outcomes are designed to be measurable. As it is particularly difficult to measure impact on people's behaviours, it is useful to formulate 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: Feedback on ways to facilitate data management and sharing

Following the introduction of a Data Management and Sharing Policy by the US National Institutes of Health in 2023, the Stanford Program for Rigor and Reproducibility (SPORR) at Stanford Medicine, in collaboration with Stanford's Lane Library, conducted focus groups to understand the data sharing and management practices of Stanford early career researchers and the support they might need to follow NIH policy.[72] The results showed that participants:

- wrote data management plans only when required by an ethics committees or funding body
- shared data only when required by funders or journals
- generally used cloud-based services to store their research data and to share with collaborators or statisticians but were unsure about the security of these services and the best methods for using them
- emphasised the effort required to prepare and store data properly
- feared that, without dedicated funding, incentives or mandates to make these practices required, investing the time in data management might put them at a disadvantage for career advancement.

The participants in the focus groups suggested that the following web resources would be helpful:

- one main data page that collates all data policies, services and resources
- data management plan templates
- flowcharts for data sharing and management per data type
- guidance on how to initiate data discussions at their lab.

These results from the focus groups will now be used to develop a survey that will be sent to all members of Standford School of Medicine.

5. Definitions and abbreviations

5.1 Definitions

For the purposes of this Guide, terms are defined in **Table 13**.

Table 13. Definitions

Term	Definition
Collaboration (research)	Sharing of knowledge and expertise and working together within and between teams, academic disciplines (inter- and trans-disciplinary) and institutions; as well as with the community and relevant education, policy and industry sectors.
Community	A group of people sharing a common interest (e.g. cultural, social, political, health, economic interests) but not necessarily a particular geographic association. Different types of communities are likely to have different perspectives and approaches to their involvement in research.[21] (Note: 'Research community' is defined separately.)
Consumer	Patients and potential patients, carers, and people who use health care services. Collectively, 'consumers' and 'community members' may be referred to as 'the public'.[21]
Cultural competence	The set of behaviours, attitudes and policies that enable people to work ethically and effectively in cross-cultural situations.
Cultural safety	The individual and institutional knowledge, skills, attitudes and competencies needed to deliver a safe working environment, for Aboriginal and Torres Strait Islander researchers, which is free of racism.[73]
Early- and mid-career researcher	Emerging scientists who are up to 15 years post-PhD (or other research higher degree) irrespective of professional appointment.[74]
High-quality research	Research that has been performed responsibly, ethically and to the highest possible standard, in accordance with international best practice principles, for the full duration of the research cycle, that is throughout the design, conduct, analysis, reporting, translation and implementation of the research. High quality research is rigorous, transparent and reproducible.
Indigenous data sovereignty	The right of Indigenous people to exercise ownership over Indigenous data. Ownership of data can be expressed through the creation, collection, access, analysis, interpretation, management, dissemination and reuse of Indigenous data.[75]
Indigenous knowledge	For Aboriginal and Torres Strait Islander people, Indigenous knowledge, also called Traditional Knowledge and Traditional Cultural Expressions, is an important asset belonging to Aboriginal and Torres Strait Islander people, their communities, organisations and businesses. Indigenous Knowledge can reflect and identify a community's history, cultural and social identity, and its values.[76]

Term	Definition
Institution	An institution that administers NHMRC or other health research funds and includes universities, hospitals, health services and medical research institutes that meet defined research governance requirements. Participating and administering institutions are included.
Institutional leader	Senior administrators within the institution.
Research student	Undergraduate or postgraduate student involved with the conduct of research.
Leaders	Institutional leaders and research leaders.
Open science	A set of principles and practices that aim to make scientific research from all fields accessible to everyone for the benefits of scientists and society as a whole. Open science is about making sure not only that scientific knowledge is accessible but also that the production of that knowledge itself is inclusive, equitable and sustainable.[28]
Peer generative power	The unique strength of the power generated by cohorts of Aboriginal and Torres Strait Islander researchers from diverse backgrounds, arising from their shared historical experience, co-understanding of problems with health and medical research and their shared aspirations to reform it.
Questionable research practices	Behaviours that have an adverse effect on the quality and trustworthiness of the research and that are not misconduct. 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.
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.[77]
Research	The concept of research is broad and includes the creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies, inventions and understandings. This could include synthesis and analysis of previous research to the extent that it is new and creative.
Research community	All those responsible for, or involved with, the conduct, administration and oversight of research.
Research culture	The behaviours, attitudes, values, expectations and norms of research communities.
Research leader	Person who leads a research team, which often includes setting the direction of the research, securing research grant funding, supervising students and postgraduate researchers, generating research outputs, liaising with stakeholders and supporting and nurturing the research careers of others.

Term	Definition
Research quality	The way the research is planned, performed and reported, as well as the methodology, rigour and judgement applied to all aspects of the process.[15]
Researcher	Person (or persons) who conducts, or assists with the conduct of, research.
Responsible research practices	Behaviours a researcher can engage in at all stages of the research cycle to improve the quality and trustworthiness of the research.[78]

5.2 Abbreviations

Abbreviations used in this Guide are listed in **Table 14**.

Table 14. 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
EMCR	Early- and mid-career researcher
FAIR	Findable, Accessible, Interoperable and Reusable
HDR	Higher degree research
KPI	Key performance indicator
NHMRC	National Health and Medical Research Council
PREPARE	Planning Research and Experimental Procedures on Animals: Recommendations for Excellence
UKRN	United Kingdom Reproducibility Network.

6. Resources and references

6.1 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,[3] the Wellcome Trust[51], the Russell Group[79] and the Nuffield Council for Bioethics.[80] These reports have informed the UK Government's *Research and development people and culture strategy*, published in 2021.[81] 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.[82] 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.[83]
- 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.[84] 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.[85]
- The University of Cambridge Data Champion program.[37]
- Reproducibility and Research Integrity (2023). UK Parliament House of Commons Committee Report.[86]

6.2 Resources

This section provides information about general resources for particular topics, which complement the specific references provided in **Section 6.3**. The webpage links for these resources are current at the time of publication.

6.2.1 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.	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.	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.	nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2025
AIATSIS Code of Ethics for Aboriginal and Torres Strait Islander Research.	aiatsis.gov.au/research/ethical-research/code-ethics
Science Europe. A values framework for the organisation of research.	scienceeurope.org/our-priorities/research-culture/research-values-framework

6.2.2 Approaches to implementing institutional change

Topic	URL
Exchanges: The Interdisciplinary Research Journal 11(3) (Summer 2024). Special Issue: Research culture.	doi.org/10.31273/eirj.v11i3
ACOLA (2023). Research Assessment in Australia: Evidence for Modernisation. A report to the Office of the Chief Scientist. Australian Government, Canberra.	acola.org/research-assessment
The Embassy of Good Science.	embassy.science/wiki/Main_Page

6.2.3 Role modelling and leadership

Topic	URL
Anderson WP. Trust in Medical Research: what scientists must do to enhance it. (2023) Monash University. Monograph.	bridges.monash.edu/articles/monograph/Trust_in_Medical_Research_What_Scientists_Must_Do_to_Enhance_It/23827920
Bulat A. The UCL Good Supervision Guide: A guide for new and experienced supervisors. University College London (2018).	ucl.ac.uk/teaching-learning/sites/teaching-learning/files/ucl_good_supervision_guide_2018-19_screen.pdf
Farkas AH, Bonifacino E, Turner R, Tilstra SA, Corbelli JA. Mentorship of Women in Academic Medicine: A Systematic Review. J Gen Intern Med. (2019) Jul;34(7):1322-1329.	doi.org/10.1007/s11606-019-04955-2
SOPs4RI consortium. Guidelines for research institutions on supervision and mentoring, Online version 1 (2021).	doi.org/10.17605/OSF.IO/E2BSJ
The Royal Society. Integrity in practice toolkit.	royalsociety.org/-/media/policy/projects/research-culture-images/integrity-in-practice-september-2018.pdf
UKRIO UK Research Integrity Office. Research Integrity Champions, Leads and Advisers.	ukrio.org/ukrio-resources/publications/research-integrity-champions-leads-advisers

6.2.4 Education and training

Topic	URL
ARRIVE guidelines- a checklist of recommendations to improve the reporting of research involving animals.	arriveguidelines.org
Australian Council of Graduate Research. Good Practice Guidelines, Good Practice Framework for Research Training. (2012).	acgr.edu.au/good-practice/best-practice
C4R Community for Rigor. A free, open resource to help researchers of all kinds learn, practice and promote scientific rigour.	c4r.io
Equator Network- provides links to reporting guidelines for the main study types.	equator-network.org/reporting-guidelines
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).	op.europa.eu/en/publication-detail/-/publication/fca9ae7f-2554-11e9-8d04-01aa75ed71a1/language-en

FORRT: Framework for Open and Reproducible Research Training. A community-driven organisation for educators who wish to integrate open and reproducible science principles into their teaching.	forrt.org
PREPARE: Planning Research and Experimental Procedures on Animals: Recommendations for Excellence.	norecopa.no/prepare

6.2.5 Institutional resources

Topic	URL
Center for Open Science: TOP Guidelines. Transparency and Open Promotion Guidelines for journals that can be used by authors, reviewers, editors, readers, publishers and funders.	cos.io/initiatives/top-guidelines
RRIDs: Research Resource Identification. Research Resource Identifiers are ID numbers assigned to help researchers cite key resources in the biomedical literature to improve transparency of research methods.	rrids.org
SOPs4RI Consortium. Research Integrity tools for RPOs.	sops4ri.eu/tools
TIDieR: Template for Intervention Description and Replication. A guide and reporting checklist for authors of any study design that evaluates an intervention, and for journal peer reviewers and editors, that has been developed to improve the completeness of reporting and the replicability of interventions.	tidierguide.org
UK Parliament. Reproducibility and research integrity: Sixth report of session 2022-23.	publications.parliament.uk/pa/cm5803/cmselect/cmsctech/101/report.html

6.2.6 Aboriginal and Torres Strait Islander researchers

Topic	URL
AIATSIS Code of Ethics for Aboriginal and Torres Strait Islander Research Guide to Applying the AIATSIS Code of Ethics.	aiatsis.gov.au/research/ethical-research/code-ethics
CARE Principles for Indigenous Data Governance.	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.	closethegapfoundation.org/glossary/cohort-based-learning
NHMRC Workshop report: Strengthening and growing capacity and capability of Aboriginal and Torres Strait Islander health researchers. Melbourne University Business School, 16-17 May 2018.	nhmrc.gov.au/health-advice/aboriginal-and-torres-strait-islander-health/building-and-strengthening-capacity-indigenous-health-researchers
NHMRC Ethical conduct in research with Aboriginal and Torres Strait Islander Peoples and communities: Guidelines for researchers and stakeholders (2018). Commonwealth of Australia, Canberra.	nhmrc.gov.au/research-policy/ethics/ethical-guidelines-research-aboriginal-and-torres-strait-islander-peoples
NHMRC. Keeping research on track II: A companion document to Ethical conduct in research with Aboriginal and Torres Strait Islander Peoples and communities: Guidelines for researchers and stakeholders (2018). Commonwealth of Australia, Canberra	nhmrc.gov.au/research-policy/ethics/ethical-guidelines-research-aboriginal-and-torres-strait-islander-peoples
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.	lowitja.org.au/wp-content/uploads/2023/05/Career_Pathways_Report_Working_for_Our_People_2020.pdf
Universities Australia. Indigenous Strategy 2022-25.	universitiesaustralia.edu.au/publication/indigenous-strategy-2022-25

6.2.7 Rewards and recognition

Topic	URL
ACOLA (2023). Research Assessment in Australia: Evidence for Modernisation. A report to the Office of the Chief Scientist. Australian Government, Canberra.	acola.org/research-assessment
Centre for Open Science (2022). Supporting open science in the promotion and tenure process: lessons from the University of Maryland. Webinar.	cos.io/blog/open-science-promotion-and-tenure-process-webinar
Coalition for Advancing Research Assessment (CoARA).	coara.eu
DORA. San Francisco Declaration on Research Assessment. Resources available include: • SPACE to evolve academic assessment: A rubric for analyzing institutional conditions and progress indicators • Tools to Advance Research Assessment (TARA).	sfdora.org/read
European Commission (2022). Einstein Foundation Award for Promoting Quality in Research.	euraxess.ec.europa.eu/worldwide/asean/einstein-foundation-award-promoting-quality-research#
European Commission (2022). Open Research Europe. Reforming research assessment: what does it mean for Open Research Europe?	open-research-europe.ec.europa.eu/blog/reforming-research-assessment
Hong Kong Principles.	wcrif.org/hong-kong-principles
Science Europe (2022). The Agreement on Reforming Research Assessment.	scienceeurope.org/news/rra-agreement-final
Science Europe (2020). Position Statement and Recommendations on Research Assessment Processes.	scienceeurope.org/our-resources/position-statement-research-assessment-processes
UK Reproducibility Network (2021). UKRN Statement on rewards and Incentives for Open Research.	osf.io/preprints/osf/v5jrm_v1
University of Maryland, Department of Psychology. Departmental Policies and Initiatives.	psyc.umd.edu/resources/department-policies-initiatives
Wellcome Trust. Guidance for research organisations on how to implement responsible and fair approaches for research assessment.	wellcome.org/grant-funding/guidance/open-access-guidance/research-organisations-how-implement-responsible-and-fair-approaches-research

6.2.8 Communication

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

6.2.9 Monitoring, evaluation and reporting

Topic	URL
Australian Government- The Treasury. Australian Centre for Evaluation and Evaluation toolkit.	evaluation.treasury.gov.au
Better Evaluation, a part of the Global Evaluation Initiative, provides many useful resources.	betterevaluation.org
Stanford Medicine. Stanford Program on Research Rigor & Responsibility. Monitoring and Accountability.	med.stanford.edu/sporr/monitoring.html
State government resources, for example, the NSW Government: Evaluation resource hub.	education.nsw.gov.au/teaching-and-learning/professional-learning/pl-resources/evaluation-resource-hub

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