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# The embedded researcher experience in Australia: Comparison by professional discipline

## Abstract

To support the implementation of research evidence into practice, the embedded researcher model, where a researcher is embedded as a core member of the clinical team, offers promise. The aim of this study was to investigate and compare how the embedded researcher model has been adopted by different professional discipline groups in Australia. A purposive sample of current and former embedded researchers were invited to participate in an exploratory online survey. Responses were described using Excel and analysed using SPSS. Perspectives of 104 Australian embedded researchers were compared across three core professional disciplines; of nursing and midwifery (37), allied health (36), and medicine (27). Professional differences were reported in respondents' qualifications and experience, employment conditions and their research cultures and environments.

Comparatively most medical, nursing and midwifery embedded researchers were older, more clinically experienced than allied health respondents, who were younger and more research qualified. As embedded researchers, most medical respondents prioritised conducting their own research while more nursing and midwifery and allied health respondents reported complementing clinical research within their teams with a mix of research capacity building, management and clinical practice roles. Each professional discipline's experiences are likely influenced by their own profession's research histories and paradigms.

**Keywords:** Embedded research, evidence translation, health-academic partnerships, clinician researchers, research culture

## Background

Engaging health professionals in research has the potential to improve healthcare organisational performance, patient satisfaction and staff retention<sup>1,2</sup>. These benefits to patient care and service delivery can be enhanced when research is led by the health professionals who will use it<sup>3</sup>.

Consequently, as clinicians identify clinical needs and collaborate with researchers to address them, resultant research has the potential to improve clinical practice<sup>2</sup>. Conversely, the McKeon review of Health and Medical Research in Australia concluded that researchers should engage more directly with clinicians to ensure that research addresses key clinical needs and provides practical and implementable solutions<sup>4</sup>. However, the literature about engaging health professionals in conducting and leading research is still evolving and many ongoing initiatives show promise<sup>3,5,6</sup>.

The model of embedded researchers has received recent attention and describes researchers who work in both academic and healthcare institutions<sup>7</sup>. As they are embedded in a healthcare organisation, they can access local contextual information not readily available to outsiders and better understand local pressures, problems and priorities<sup>8,9</sup>. Consequently, embedded researchers have greater access for data collection and have better organisational insights into policies and practices affecting healthcare practitioners, managers and service users. With similar access to academic knowledge and networks, they can co-design and produce research that is both relevant and practical for clinicians and other end users, while incorporating clinical practice changes<sup>8,10</sup>. In addition, embedded researchers are able to facilitate and build the healthcare organisation's research capacity by establishing a research culture and teaching evaluation and research skills<sup>8</sup>.

Concurrent with the increasing use of embedded research, the practice of evidence based medicine developed initially to integrate doctors' clinical expertise with current best research evidence to

make decisions about the care of individual patients<sup>11</sup>. Early descriptions of best available evidence were described as clinically relevant research, often from the basic sciences of medicine<sup>11</sup>. Early research in evidence-based practice included both doctors and nurses as study populations<sup>12</sup>. At the same time in Australia, a distinct allied health professional community emerged with new organisational structures that managed clinical professionals who were neither doctors nor nurses together<sup>13</sup>. These allied health professionals often worked in multidisciplinary teams, community settings and focussed on patient centred outcomes. As they became interested in evidence-based practice, allied health professionals required broader research paradigms, beyond basic sciences, to provide a substantial clinically relevant research base<sup>14-16</sup>.

As the embedded researcher model has developed, there is a lack of clarity about the experience, expertise and specialisation of the researcher<sup>7,17</sup>. In particular, it is not clear how the model has been adopted across the three largest professional disciplines in Australian healthcare; represented by doctors, nurses and midwives, and allied health professionals. Each professional discipline group has different disciplinary knowledge and research practices and is informed by different research paradigms and literatures<sup>18</sup>. Within a broad mixed-methods study designed to describe the characteristics and experiences of embedded researchers in Australian healthcare settings at the beginning of 2019, this paper will investigate and compare experiences across different professional disciplines.

## **Materials and Method**

An online survey was developed by the authors for embedded researchers to describe key aspects of their role and to document perspectives of their experience. A range of questions were developed

and piloted for quick responses, including Likert scales, drop-down menus, and open-ended questions.

### **Survey description and development**

For Likert scale questions, respondents were asked to rate eight statements in relation to their role as embedded researchers on a Likert scale from never (1) to always (5), eight statements in relation to the research culture of the healthcare organisation on a Likert scale from disagree (1) to agree (4), and four statements in relation to their dual affiliation on a 3 item scale from disagree (1) to agree (3). The survey took approximately 15 minutes to complete.

### **Participants**

A purposive sample of current and former embedded researchers were invited to participate<sup>19</sup>. Embedded researchers were defined as individuals with research qualifications who worked, or had worked, for at least 30% of their time in a healthcare organisation doing research or research capacity building. The survey was administered via an online link emailed to potential participants, with supporting information about the study. Both authors invited colleagues from their relevant local and national networks to participate. Using a modified snowball sampling strategy<sup>20</sup>, this initial group of respondents were asked to share the email invitation with other embedded researchers that they knew.

### **Analysis**

Data was described using Excel and analysed using SPSS. Initially data were described and analysed as a whole, and then responses of embedded researchers were compared based on professional discipline. Responses are presented using whole numbers and percentages. The mean of 4 or 5 item Likert scale responses were calculated, after removal of “don’t know” responses.

To test for differences in Likert scale responses (ordinal data) between respondents based on professional affiliation, a Mann-Whitney u test was used because the data was not normally distributed. The normality of the data was tested using the A Shapiro-Wilk's test ( $p > 0.5$ ), a visual inspection of their histograms, and skewness and kurtosis z-values. Significance was set at 0.05.

## Results

Of the 104 embedded researchers who completed the online survey, a third were from nursing and midwifery (35.6%,  $n=37$ ), a third from allied health (34.6%,  $n=36$ ), and a quarter from medicine (26%,  $n=27$ ). The remaining 4 respondents described themselves as a Library Services Manager, Clinical Research Centre Manager and Research Officers, and their responses have been removed from the following data analysis to focus on comparisons between the three core professional disciplines.

The majority of respondents were in a current embedded researcher role ( $n=71$ , 68%). Of the 37 embedded researchers from nursing and midwifery, 30 (81%) were in a current embedded researcher role and 7 reported on a previous role (19%). Of the 36 embedded researchers from allied health, 23 (64%) were in a current embedded researcher role and 13 reported on a previous role (36%). Of the 27 from medicine 16 (59%) were in a current embedded researcher role and 11 reported on a previous role (41%).

Almost half of current embedded researchers had been in their role for less than 2 years ( $n=28$ , 40%). This was most pertinent for nursing and midwifery ( $n=14$ , 47%) and allied health ( $n=10$ , 43%) respondents. In contrast, medical respondents had a longer history in their roles, with over half having more than 6 years' experience (Figure 1). Incumbents in previous roles generally had more

experience than current incumbents, with almost half of previous medical embedded researchers having over 16 years' experience in their role (n=5, 45%).

Insert Figure 1: Duration in embedded researcher role, by profession

### **Embedded Researcher's Age, Qualifications and Experience**

Most embedded researchers were aged between 51 and 60 years (n=41, 39%), a third were aged between 41-50 (n=30, 29%), with 16% aged 31-40 (n=17), 12% aged over 60 (n=12) and 2% aged between 20-30 (n=3). Comparatively, these proportions looked very different by profession (Figure 2). More than half of all medical and nursing and midwifery respondents were aged over 50 years, while most allied health respondents were less than 50 years old.

Insert Figure 2: Age of embedded researchers, by profession

With this age maturity, embedded researchers were also highly qualified and experienced in both clinical and academic positions. The majority of embedded researchers had been awarded a PhD (n=78, 75%) or research masters (n=10, 10%) on average eleven years ago. However, there were comparative differences between professions (Figure3). Allied health respondents reported the highest proportion of PhDs (n=30, 83%), awarded on average 13 years ago. Nursing and midwifery respondents reported the lowest proportion of PhDs (n=26, 70%), awarded 10 years ago. There were 20 (74%) medical respondents with a PhD, awarded on average 11 years ago.

Insert Figure 3: Qualification profile of embedded researchers, by profession

More than half of current embedded researchers reported over 16 years of experience in clinical positions (n=37, 55%). This is consistent for medical (n=10, 67%) and nursing and midwifery (n=18, 64%) respondents but more than half of allied health respondents reported less than 5 years clinical experience (Figure 4).

Insert Figure 4: Clinical experience of embedded researchers, by profession

In comparison, only a third of current embedded researchers reported over 16 years of experience in academic positions (n=22, 33%). This proportion is higher for medical (n=7, 47%) and allied health (n=9, 39%), compared to nursing and midwifery respondents (n=6, 21%). However, the patterns of developing academic experience are similar across the professional groups (Figure 5).

Insert Figure 5: Academic experience of embedded researchers, by profession

### **Embedded Researchers' Employment Conditions**

Of the 104 embedded researchers, half reported they were primarily employed by a healthcare organisation and half by an academic organisation. Practically, individuals need to adhere to the human resource and work practices of one organisation. This even distribution between healthcare and academic organisations was maintained for each profession. Most respondents reported having a formal conjoint appointment (n=59, 60%). Comparatively more allied health respondents (n=24, 67%) reported a formal appointment than medical (n=15, 56%) and nursing and midwifery respondents (n=22, 59%).

We defined embedded researchers as being paid at a minimum of 30% of their total salary by a healthcare organisation. Nearly half (n=43, 46%) of embedded researchers were paid at this



minimum level between by a healthcare organisation and over a third (n=36, 39%) were fully paid for by a healthcare organisation. These proportions varied between professions (Figure 6). A higher proportion of nursing and midwifery respondents (n=42, 45%) were fully paid for by their healthcare organisation, whereas most allied health respondents (n=56, 60%) were only paid at minimum levels by their healthcare organisation.

Insert Figure 6: Payment proportion by healthcare organisation, by profession

Of embedded researchers whose primary affiliation was academic (n=52), the majority were employed at Professor level (n=27, 52%), followed by Research Fellow/Senior Research Fellow or Lecturer/Senior Lecturer level (n=19, 36.5%), and Associate Professor (A/Prof) level (n=6, 11.5%). This profile is relatively consistent for medical and nursing and midwifery respondents (Figure 7). However, allied health respondents reported a higher proportion of Associate Professors (n=4, 21%).

Insert Figure 7: Academic role profile, by profession

For embedded researchers whose primary affiliation was a healthcare organisation, the majority identified as a 'clinician researcher' (n=34, 68%). The remaining respondents were employed in middle management roles (n=6, 12%), senior/executive management (n=5, 10%), mixed management/clinical practice (n=4, 8%), and project management (n=1, 2%). A large range of role titles corresponded to these reported roles, and they often identified professional affiliations as well as hierarchical level e.g. Research Fellow–Nursing. Nursing and midwifery respondents most closely matched the proportions of the whole group (Figure 8). In contrast, most medical respondents (n=11, 85%) identified as clinician researchers and there were comparatively less allied Health respondents identified as clinician researchers (n=9, 53%).

Insert Figure 8: Clinical role profile, by profession

Most embedded researchers reported clear reporting lines within their organisation. Many different role titles of line managers were reported, and they often identified professional affiliations as well as hierarchical level. There appeared to be as many differences within professions as between them, for this sample of respondents. Most embedded researchers also managed staff (n=59, 59%).

Proportions varied between professions, with most medical respondents (n=22, 85%) managing larger numbers (2-26) of staff. Half of allied health respondents (n=20, 56%) also managed teams of up to 30 research, administrative and clinical staff. In contrast, a lesser proportion of nursing and midwifery respondents (n=14, 41%) managed smaller groups (1-13) of staff.

Most medical and nursing and midwifery respondents reported belonging to teams, named by the clinical or diagnostic group e.g. respiratory or endocrinology team. In contrast, most allied health embedded researchers reported belonging to allied health service teams, with some identifying a specific professional team e.g. physiotherapy. This suggests that allied health respondents maintain a strong professional identity.

### **Research Environment**

Although most embedded researchers reported that research was a strategic objective of their healthcare organisation, agreement was highest amongst allied health (n=34, 94%) and nursing and midwifery respondents (n=30, 91%), and lowest for medical respondents with only 17 (65%) agreeing.

Overall, most embedded researchers engaged in personal research (89%), clinical team/group's research (89%), linking people and networking (82%), capacity building (81%) and project management (71%), while only a third reported engaging in information management (34%).

However, the way in which embedded researchers enacted their role differed by professional discipline. Comparatively, most medical respondents engaged in personal research (n=25, 96%) and reported variable levels of engagement in networking (n=18, 69%), project management (n=14, 54%) and information management (n=4, 15%). In contrast, most nursing and midwifery and allied health respondents engaged in their team's clinical research and the majority of allied health respondents also engaged in capacity building (n=33, 92%). Comparatively nursing and midwifery and allied health respondents also engaged in more tasks around information management, networking and project management than medical respondents (Figure 9).

Insert Figure 9: Engagement in research activities by profession

Embedded researchers were asked to rate their experience of working as an embedded researcher in relation to 8 statements on a 5-point Likert scale from never to always (Table 1). High and consistent agreement was reported around building collaborative relationships between clinical and academic teams. However different patterns were evident between professional disciplines. Significant differences in mean responses were noted between medical and allied health respondents. Medical respondents reported least experience of working with clinicians to identify clinically important research questions and apply research findings in their practice, and they reported least recognition for building clinicians' research capacity and least support by their clinical managers. For these statements, nursing and midwifery respondents offered mean responses between medicine and allied health. However, for the statement where embedded researchers design research with stakeholders so it will be relevant to end users, medical respondents reported significantly lower mean responses than nursing and midwifery and allied health respondents.

Insert Table 1: Mean responses to embedded researcher experience, by profession

Embedded researchers were asked to rate their level of agreement with 8 statements describing the research culture of their healthcare organisation on a 4-point scale from disagree to agree. The highest responses and most consistent agreement were for clinical practice being informed by research and research being co-produced with academic partners. However, mean responses varied between professions (Table 2). Significant differences were noted where medical respondents rated their organisations' commitment to research, and its recognition and value for health services research lower than other respondents. Overall, allied health respondents rated the research culture most positively, except where medical respondents agreed that research was initiated by their own personal/career agenda).

Insert Table 2: Mean responses of healthcare organisation's research culture, by profession

### **Embedded Researcher's Experience of Dual Affiliation**

Two-thirds of embedded researchers (n=69, 66%) reported having a dual affiliation, of which 59 reported a formal conjoint appointment. They rated their experience of a dual affiliation across 4 statements using a 3-point Likert scale from disagree to agree (Figure 10). Consistently, half of all respondents reported struggling to manage the demands of both clinical and academic organisations, despite over half agreeing that co-production of research is valued by both organisations. Comparatively, nursing and midwifery respondents reported higher levels of conflict between expectations of both organisations, and lower levels of value by the academic institution of their research achievement in the clinical organisation.

Insert Figure 10: Responses describing dual affiliation experience, by profession

## Discussion

This study reports perspectives of 104 Australian embedded researchers representing three core professional disciplines; of nursing and midwifery (37), allied health (36), and medicine (27). Most respondents reported on their current positions, however almost half reported less than 2 years' experience in their current role, and medical respondents reported the longest time in previous and current roles.

Professional differences in qualification and experience have been tracked through employment conditions into research cultures and environments, to demonstrate how different professional disciplines have enacted embedded researcher roles. Comparatively most medical, nursing and midwifery embedded researchers were older, more clinically experienced and reported a higher proportion of their positions paid for by healthcare organisations than allied health respondents. Notable variations were reported between affiliation and professional group. Over half of respondents who had a primary academic affiliation had a professorial title, and while this was consistent between professional disciplines, there were comparatively more allied health respondents with a PhD and research master's qualifications and with an associate professor title. For the embedded researchers with a clinical affiliation, most medical respondents were focussed clinician researchers. However, up to a third of nursing and midwifery clinician respondents and a half of allied health respondents reported complementing their clinician researchers' roles with a mix of management and clinical practice roles.

It appears that these differences in affiliation also influenced professional differences in research activities and perceptions of the healthcare organisations' research culture. Medical embedded

researchers reported a strong focus on their own clinical research, which was initiated by their own personal/career agenda. In comparison, allied health embedded researchers reported networking, engaging with and building research capacity of clinicians. Half of the medical respondents rated the healthcare organisation's culture significantly lower than their peers in relation to their organisations' commitment to research, and its recognition and value for health services research. In comparison, allied health respondents rated the healthcare organisation's research culture most positively.

This study describes how different professional disciplines have discrete trajectories and experiences of research, which may be reflective of the paradigms required to achieve the promised outcomes of embedded research. It seems that older and clinically experienced medical embedded researchers have focussed on producing clinical research to support their personal careers. They have had limited experience in building the capacity for research in their peers and are critical of their healthcare organisations in being able to strategically and practically support collaborative research. Their research activities may reflect the more traditional origins of evidence-base medicine and the funding priorities of the National Health and Medical Research Council (NHMRC) for basic biomedical science and clinical medicine <sup>21</sup>.

In comparison, the younger, more research qualified allied health embedded researchers may have stronger academic associations and be protected by more formal conjoint appointments. They report working across a greater mix of management and clinical positions in the healthcare organisations and are collaborating with clinical teams to engage and co-produce research while also building clinicians' research capacity. Consequently, they rated their healthcare organisation's research culture most positively and report recognition and value for their research achievements. While traditional funding allocation for allied health clinical research has been low and imbalanced

compared to that of other professions internationally, there has been an enthusiasm for understanding the complexities of research capacity building<sup>22,23</sup>. Further, allied health clinicians have recognised the need to engage healthcare managers to influence and support clinicians research capabilities, in order to use research to inform practice. Promoting research as an organisational core value, with support from senior managers can establish structures, processes and systems to facilitate research and reinforce evidence-based practice<sup>22,24</sup>.

In between, nursing and midwifery embedded researchers in this sample represent an older and clinically experienced workforce, with least research qualifications and academic experience. They have a stronger alignment and financial reimbursement from their healthcare organisation, in which they occupy a range of clinician researcher and management roles. Their reports of conflicting expectations and lower value for their research achievements may in part represent their professional middle road between scientific and humanist research paradigms. Nursing practice has historically emphasised the importance of qualitative research in understanding the trajectory of patient care and in the development of practice and policy<sup>25</sup>.

A key limitation of this study is that we do not know how representative our sample is because we do not have consistent national strategies to delineate the range and number of embedded researcher positions. This limits this study's generalisability and emphasises the need for more consistent reporting mechanisms and continued research. Further, the online survey was designed specifically for this study and can only be descriptively reported. Further research is required to understand any underlying mechanisms and to better explore the correlations described.

Practical recommendations from this study reinforce the importance of building research capacity within clinical teams. Embedded researchers are well placed to co-design research that is clinically important and to support peers to implement practice improvements. When individuals in clinical

teams have developed their research skills, they can help ensure research is viewed favourably and used within the healthcare organisation, independently of any embedded researchers<sup>7</sup>. These research capacity building skills may be more amenable to allied health and nursing and midwifery embedded researchers. However, it is worth noting the dual aims of the National Health and Medical Research Council (NHMRC) in Australia to support discovery research and achieve community benefits of research<sup>21</sup>. While medical embedded researchers may be leading discovery research, allied health embedded researchers may be most able to apply new knowledge quickly for the benefit of the community.

## Conclusions

The diversity of professional disciplines' experiences as embedded researchers in Australia early in 2019 has been described. The model of the embedded researcher as a core member of healthcare organisations' research teams underpins different professional trajectories across the three largest professional disciplines in Australian healthcare; notably doctors, nurses and midwives, and allied health professionals. Each professional discipline's experiences are likely influenced by their own profession's research histories and paradigms. Medical embedded researchers are typically older, more clinically experienced and focussed on producing personally relevant clinical research. Conversely, allied health embedded researchers are younger, more research qualified and have stronger academic associations. They work across management and clinical positions and collaborate with clinical teams to engage and co-produce research. In between, nursing and midwifery embedded researchers are typically older and clinically experienced but have the least academic qualifications and experience. They experience conflicting expectations between both organisations and perceive a lower academic value for their research achievement. It may take time



to align all professional disciplines across scientific and humanist research paradigms to be able to achieve enhanced research uptake across academic and health service organisations.

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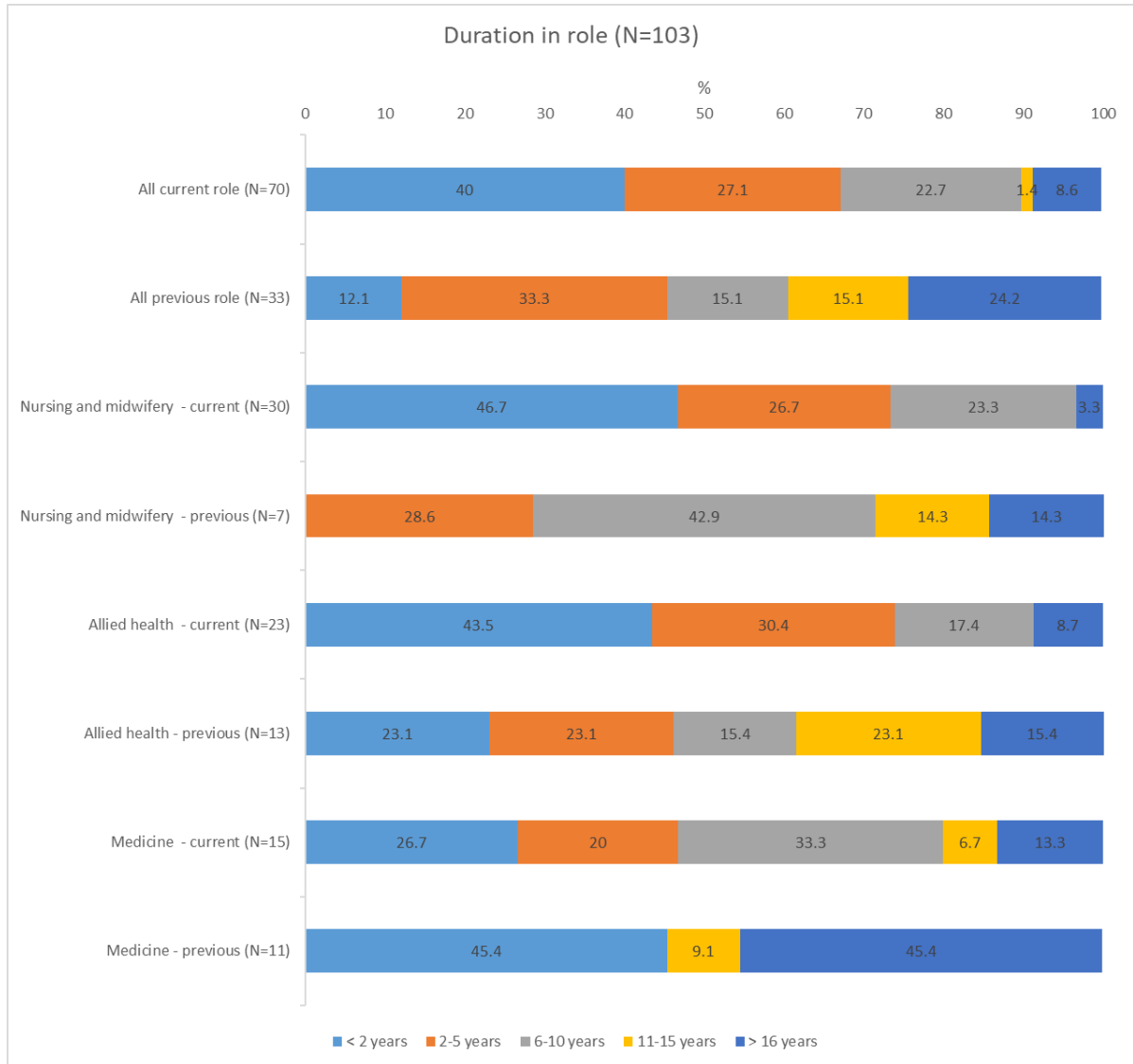
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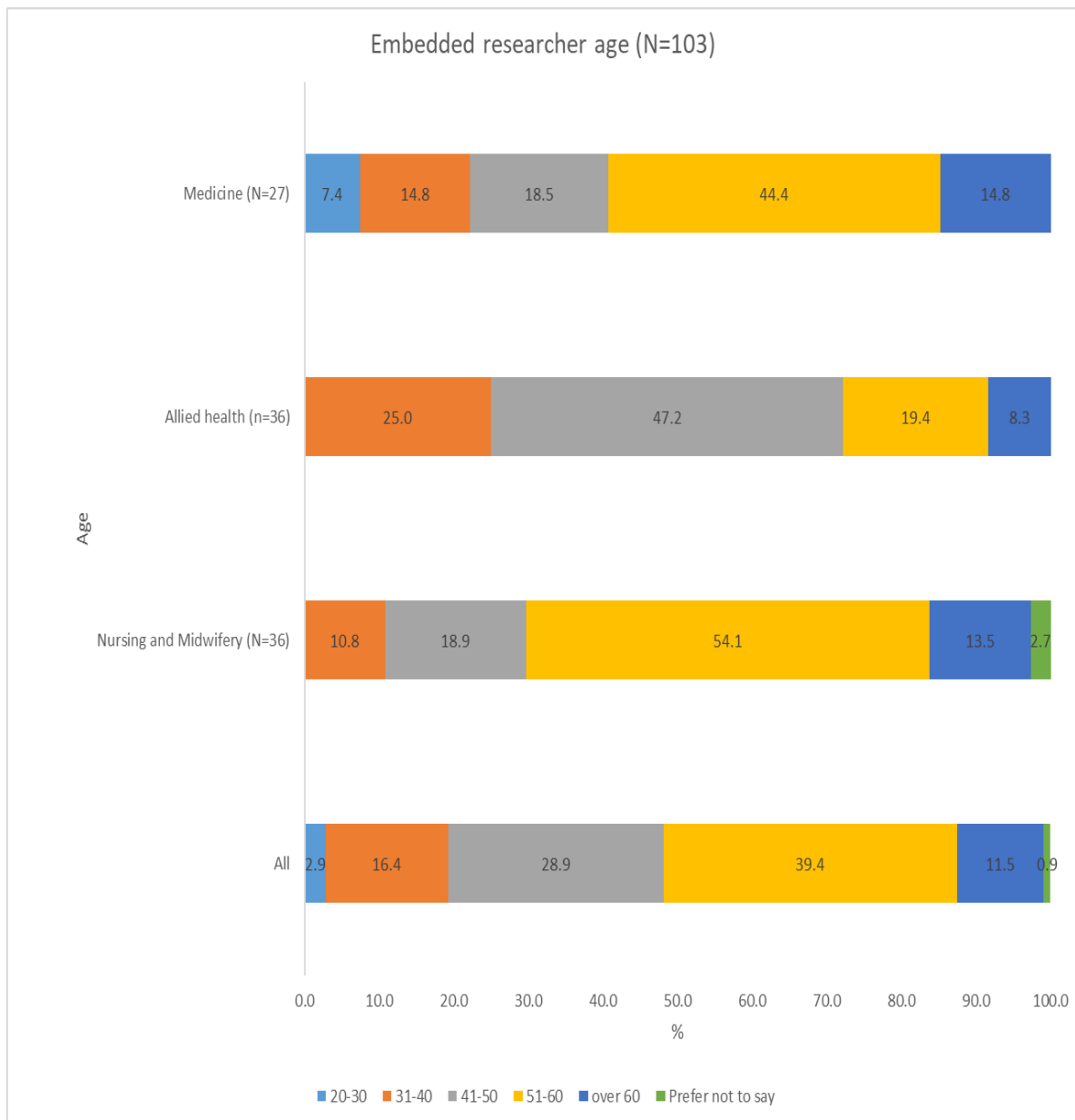
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## Figures for Manuscript - The embedded researcher experience in Australia: comparison by professional discipline

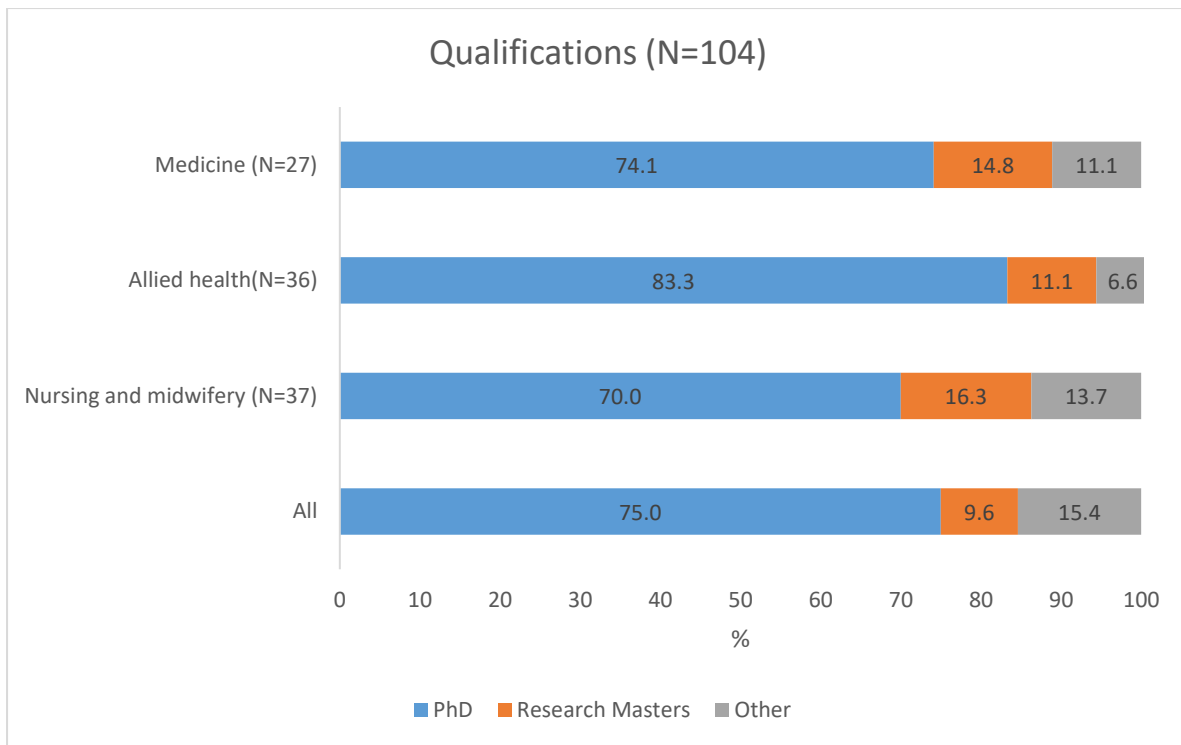
Figure 1: Duration in embedded researcher role, by profession



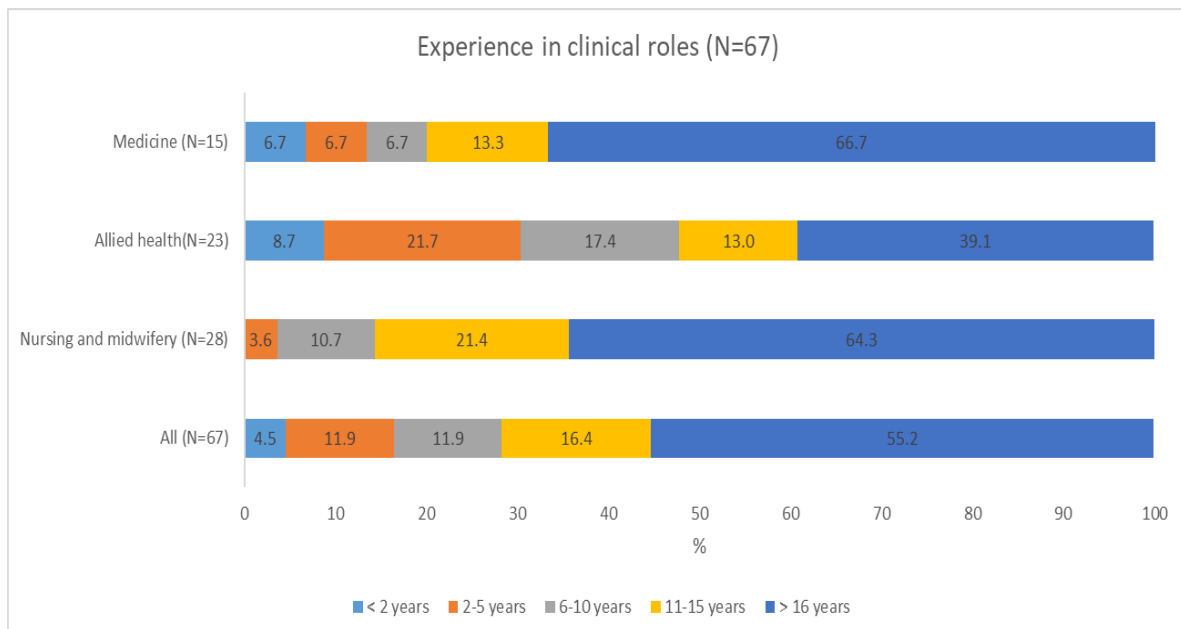
**Figure 2: Age of embedded researchers, by profession**



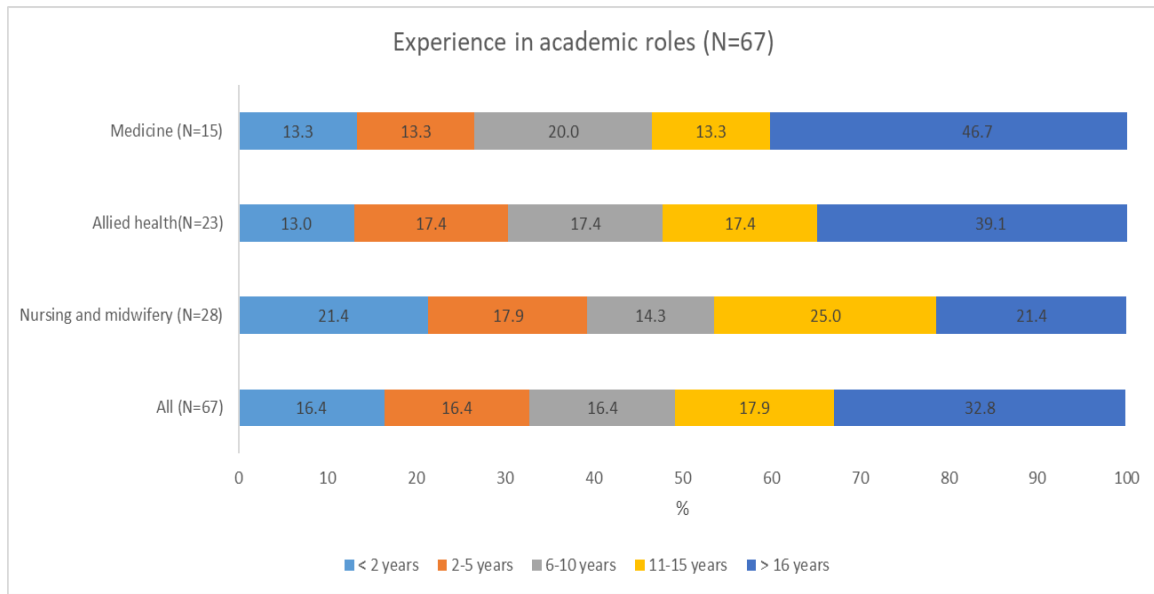
**Figure 3: Qualification profile of embedded researchers, by profession**



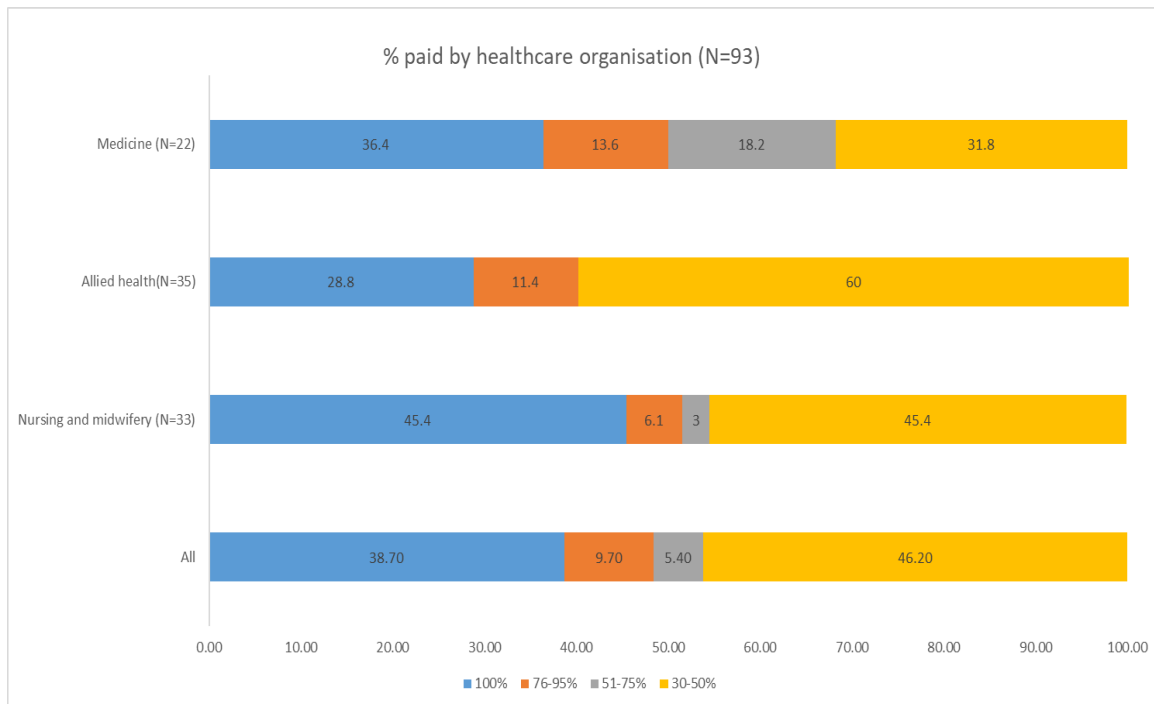
**Figure 4: Clinical experience of embedded researchers, by profession**



**Figure 5: Academic experience of embedded researchers, by profession**

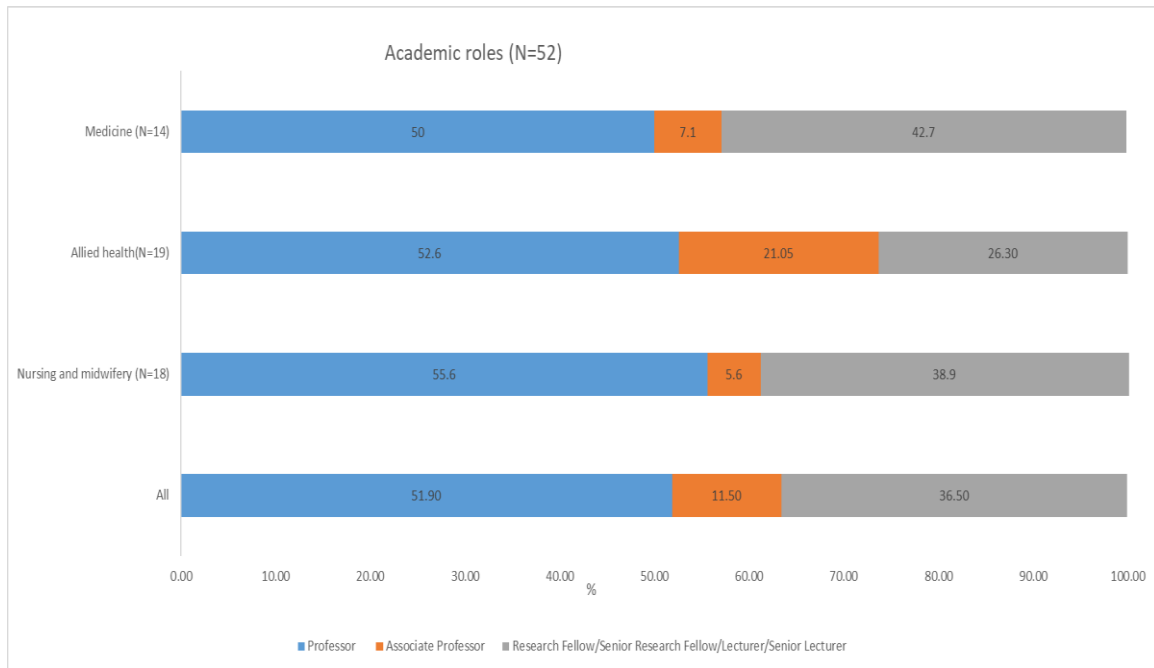


**Figure 6: Payment proportion by healthcare organisation, by profession**

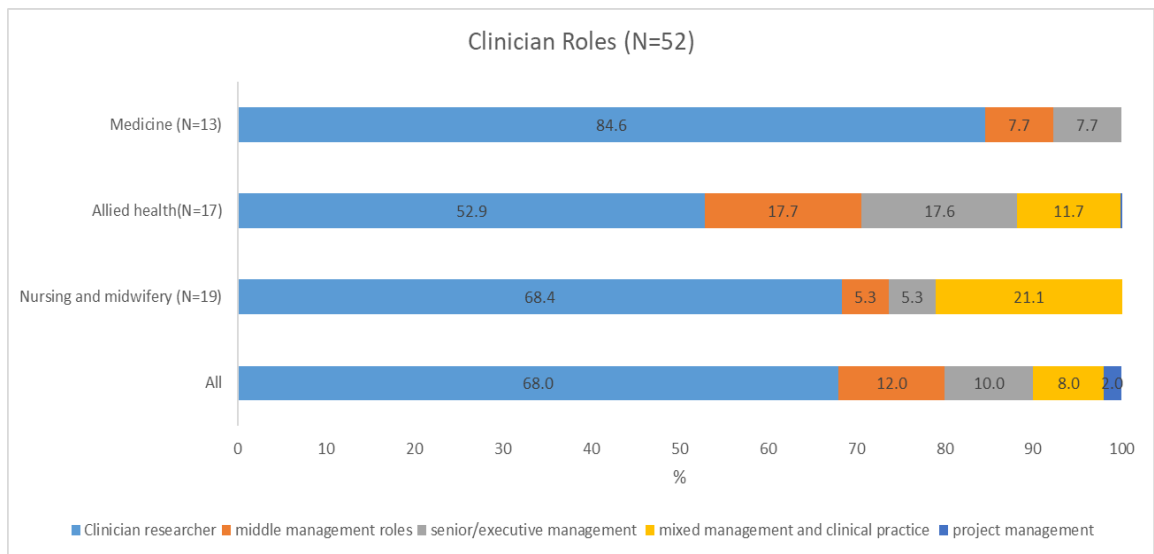




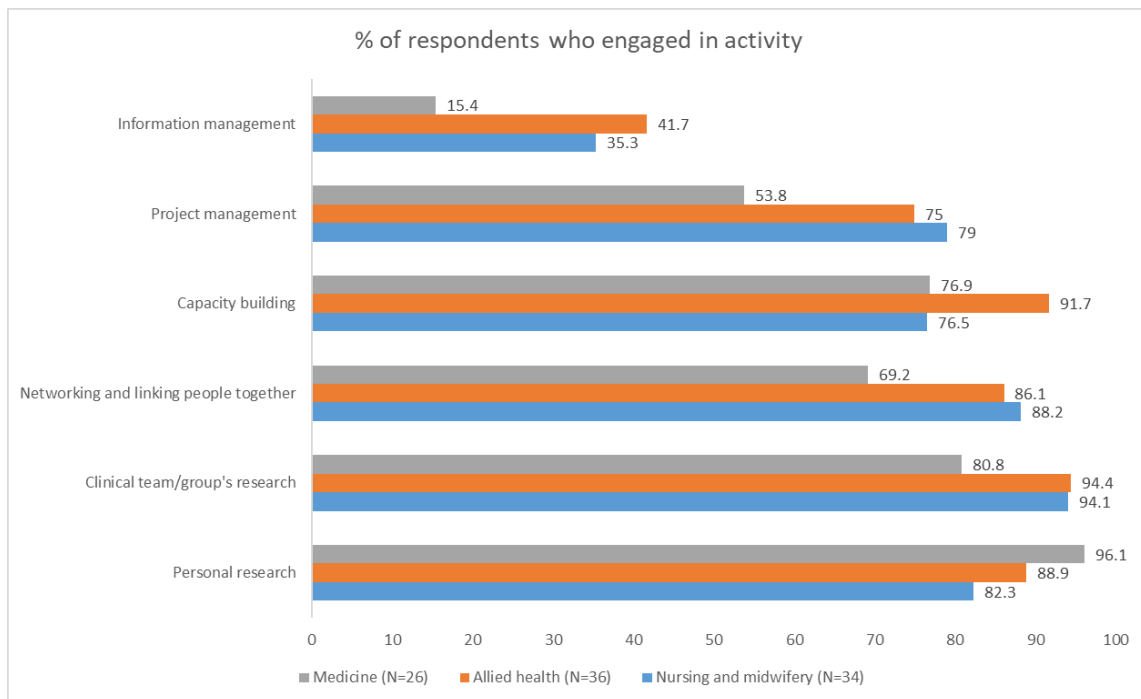
**Figure 7: Academic role profile, by profession**



**Figure 8: Clinical role profile, by profession**



**Figure 9: Engagement in research activities, by profession**



**Figure 10: Responses describing dual affiliation experience, by profession**

