

Bond University
Research Repository



The embedded researcher model in Australian healthcare settings: comparison by degree of "embeddedness"

Coates, Dominiek; Mickan, Sharon

Published in:
Translational Research

DOI:
[10.1016/j.trsl.2019.10.005](https://doi.org/10.1016/j.trsl.2019.10.005)

Licence:
CC BY-NC-ND

[Link to output in Bond University research repository.](#)

Recommended citation(APA):
Coates, D., & Mickan, S. (2020). The embedded researcher model in Australian healthcare settings: comparison by degree of "embeddedness". *Translational Research*, 218, 29-42. <https://doi.org/10.1016/j.trsl.2019.10.005>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

For more information, or if you believe that this document breaches copyright, please contact the Bond University research repository coordinator.

The embedded researcher model in Australian healthcare settings: Comparison by degree of 'embeddedness'

Coates, Dominiek¹

Mickan, Sharon²

¹University of Technology Sydney, Faculty of Health, Sydney, Australia, Dominiek.Coates@uts.edu.au

²Adjust Professor, Griffith University, Griffith Health, Australia, s.mickan@griffith.edu.au

Dr Dominiek Coates, PhD (corresponding author)

Senior Research Fellow, Faculty of Health, University of Technology Sydney

Level 11, Building 10, 235 Jones St. Ultimo. NSW, 2007, Australia

Dominiek.Coates@uts.edu.au

+61 0424044990

Running title: The embedded researcher model in Australia

Abstract

The embedded researcher model is a health-academic partnership where researchers are core members of a healthcare organisation, with an aim to support evidence translation. The purpose of this study was to describe the characteristics and experiences of embedded researchers in Australian healthcare settings, and investigate how the model is experienced differently based on the level of 'embeddedness'. This exploratory study utilized a purpose-designed online survey. Responses were described using Word and Excel and analysed using SPSS. To investigate how the model was experienced based on the level of 'embeddedness', we tested for differences in responses between respondents with primary academic versus healthcare affiliations. A total of 104 embedded researchers from nursing and midwifery, allied health and medicine completed the survey, with equal numbers reporting a primary academic versus primary healthcare affiliation. Most indicated that research is a strategic objective of the healthcare organisation (85.9%) yet almost a third (31%) reported that research outputs were not measured. While 60% agreed that clinical practice informed by research was valued, only 28% reported having adequate resources. Of those with a formal dual affiliation over a quarter reported conflict between expectations of the healthcare and academic organisations. Respondents with a primary academic affiliation were older, more qualified, had more research experience, had been in the role longer, and had more positive perceptions of the research culture of healthcare organisations. This study provides a starting point for healthcare organisations and academic institutions to partner in the further development and implementation of this model.

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

Introduction

The translation of research evidence into healthcare practice is increasingly recognised as complex, and evidence adoption continues to lag behind. Although research evidence and evidence-based clinical guidelines are being produced at an increasing rate, evidence is not routinely translated into clinical care (1-3). A key strategy that is increasingly recommended to help address the challenges associated with evidence adoption is the development of partnerships between healthcare and academic organisations (4, 5). Generally, in Australia and elsewhere, health research and health care provision are viewed as separate, and the responsibility of separate agencies (6, 7), and there are calls to enhance collaboration between both systems to maximise the impact of health research funding (8).

One emerging partnership model that is gaining attention is the 'embedded researcher', where the researcher is engaged as a core member of the health service delivery team (9-13). The role of the embedded researcher is to co-produce knowledge with clinicians and build the healthcare organisation's research capacity (11, 13, 14). The premise of the embedded research model is that by being immersed in the organisation, the embedded researcher has insider knowledge and access to contextual information not readily available to outsiders (9, 10), and as such can gain greater understanding of the pressures and problems faced by the organisation in implementing evidence-based care (9, 11, 13). Due to their immersion in a healthcare organisation embedded researchers can produce research that is more relevant to the healthcare service (10, 15) and support the implementation of research findings into practice (9).

While this model may have potential to enhance evidence uptake by bridging the gap between academia and health service delivery, how the model is implemented in different settings is not well

understood (14, 16), and there is a need for more research in this space (12, 14). A recent review of the embedded researcher model by Vindrola-Padros et al. (2017) identified only eight relevant articles published between 1937 and 2015 (14). Of these articles, three were editorials or discussion papers (9, 11, 16); one a study protocol; three were methodological (10, 17, 18) and one was largely unrelated but mentions that one of the authors was an embedded researcher (19). These studies were theoretical and do not provide empirical insight into the embedded researcher model. There is a need for more research into this model to better understand how the model is implemented, how it works, under what conditions and for whom (12, 20). To support the development and implementation of the model, questions are also increasing raised around the degree of embeddedness, and how embedded in the healthcare organisation a researcher should be to best support evidence translation (12, 21).

The aim of this study was to describe the characteristics and experiences of Australian embedded researchers, and investigate how the model is experienced or applied differently based on the level of 'embeddedness'. We defined an embedded researcher as someone with research qualifications who is employed for at least 30% of their time (0.3FTE) in a healthcare organisation and has research and research capacity building as part of their role, with or without a dual affiliation with an academic institution. While some definitions of embedded researchers include a dual affiliation (13), this is not always the case and some embedded researchers are entirely employed by a healthcare organisations (14). As such, for this study we adopted a broader conceptualisation of embedded research to include those researchers that are fully embedded within healthcare, providing they have translational research or research capacity building as part of their role.

To study the degree of 'embeddedness', we compared the responses of respondents with primary academic versus healthcare affiliations. Of those with a dual affiliation, some are primarily affiliated with a healthcare organisation and others with an academic organisation. By necessity, individuals

need to belong to one institution and adhere to its human resource and work practices, despite often having joint contracts and being expected to work across two organisations. As such, to better understand the whole landscape and recognise differences for embedded researchers, we compared the role of embedded researchers with a primary academic versus clinical affiliation. Healthcare and academic organisations have very different organisational drivers and outcome expectations and we considered it important to better understand how these impact on embedded researchers.

Method

An online survey was developed by the authors for embedded researchers. The design of the survey was informed by a review of the literature, the authors' experience as embedded researchers and feedback received during the pilot process. Face validity of the survey was established by seeking feedback from experts who reviewed the survey and confirmed that it measured the constructs of interest (22).

Both current and former embedded researchers were invited to participate. The survey was administered via an online link emailed to potential participants. A purposive sampling approach was used (23-25), and current and former embedded researchers were emailed an invitation to complete the survey. Both investigators invited individuals within their own relevant networks to participate, by email (69 invitations sent). This email contained supporting information about the study and included the online survey, as an electronic link. Using a modified snowball sampling strategy (26, 27), this initial group were asked to share the email invitation with other embedded researchers that they knew. While embedded researchers were able to self-identify, the email invitation clearly stipulated that only those employed by a healthcare organisation at a minimum of 30% of their time (0.3FTE) with research capacity building as part of their role met criteria.

The survey consisted of a range of drop-down menus, Likert scales and open-ended questions. 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 to always (never=1; rarely=2; sometimes=3; mostly=4; always=5), eight statements in relation to the research culture of the healthcare organisation on a Likert scale from disagree to agree (disagree=1; sometimes=2; only by certain people=3; agree=4, don't know=5), and four statements in relation to their dual affiliation on a 3 item scale from disagree to agree (disagree=1, sometimes=2, agree=3, with an option to indicate 'unsure'/not applicable). The survey took approximately 15 minutes to complete. This article regards the quantitative results only; the qualitative findings are reported elsewhere.

Data was described using Excel and analysed using SPSS. Initially data were described and analysed as a whole, and then responses of embedded researchers with a primary academic affiliations were compared to those with a primary healthcare affiliation. 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 with a primary academic affiliation versus respondents with a primary healthcare 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, but for multiple comparisons, p-values were adjusted using Bonferroni's correction (28).

Ethics approval for this study was received by University of Technology Sydney human research ethics committee (HREC reference number ETH18-2901). The study conforms to the provisions of the Declaration of Helsinki. Respondents provided informed consent.

Results

The survey was completed by 104 embedded researchers. Of these, 52 respondents (50%) reported they were primarily employed by a public healthcare organisation and 52 (50%) by an academic organisation. We specified that embedded researchers needed to work for at least 30% of their time in a healthcare organisation. From the total population of embedded researchers there were varying levels of payment and reimbursement by healthcare organisations, however, nearly half (46.2%, n=43) were paid for/reimbursed by a healthcare organisation at between 30-50%.

Of the 52 embedded researchers who were primarily employed by a healthcare organisation, most (n=35, 68%) were fully funded by their healthcare organisation. Of the 52 embedded researchers with a primary academic affiliation, only 4.7% were fully funded by a healthcare organisation, with the majority paid for/reimbursed by a healthcare organisation at between 30-50% (n=42, 81.4%). Few embedded researchers, regardless of primary affiliation, were paid for by a healthcare organisation at between 50% and 100% (5.4% were paid at between 51-75% and 9.7% were paid at between 76%-99%) (Figure 1).

Insert Figure 1: % paid for by healthcare organisation

The majority of respondents have a current embedded researcher role (n=71, 68.3%). Of the remaining 33, the time lapse since being an embedded researcher ranged from within 5 years (n=18, 17.3%), 5 to 10 years ago (n=7, 6.7%), 10 to 15 years ago (n=3, 2.9%), and longer than 16 years ago (n=5, 4.8%). There was almost equal distribution of the 71 current embedded researchers between those who were primarily affiliated with an academic institution (n=39, 55%) versus a healthcare organisation (n=32, 45%). However, almost half (n=28, 40%) had been in the role for less than two

years and this proportion was greater for embedded researchers with a primary academic affiliation versus those with a healthcare affiliation (44.7% versus 33.4%). Of the 33 embedded researchers who reported on a previous role, nearly half (n=15, 45.4%) had been in the role for less than 5 years, with this proportion greater for embedded researchers with a primary healthcare affiliation than those with primary academic affiliations (23.2% versus 60%). Respondents with a previous primary academic affiliation were most likely to have been in the role for over 16 years (38.5%, n=5) (Figure 2).

Insert Figure 2: Duration in role

Who are embedded researchers and what is their experience and qualifications?

This sample of embedded researchers represented all clinical professionals. Around 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 (3.8%, n=4) were from a non-health specific discipline such as social scientists. There was an equal distribution across primary academic versus healthcare affiliation for each discipline with the exception of the non-health discipline group (3 out of the 4 embedded researchers from a non-health discipline were primarily affiliated with a healthcare organisation).

Most had been awarded a PhD (n=78, 75%) or research masters (n=10, 9.6%), and this proportion was higher in those with an academic affiliation. Of embedded researchers with a primary academic affiliation, only 3.8% (n=2) did not have a PhD (n=47, 90.4%) or Research Masters (n=3, 5.8%). This contrasts with 13.5% (n=14) of embedded researchers with a primary healthcare affiliation who did

not have a PhD (59.6%, n=31) or Research Masters (13.5%, n=7). The remaining were completing a PhD (n=4), had a doctorate in medicine (n=1), postgraduate masters qualifications (n=7) or undergraduate honours qualifications (n=4). On average, embedded researchers were awarded their highest degree 11 years ago, with no difference between those with primary academic versus healthcare affiliation.

In terms of the clinical and academic experience current embedded researchers brought to their positions, more than half reported over 16 years of experience in clinical positions (n=37, 55.2%) and approximately a third reported over 16 years of experience in academic positions (n=22, 32.8%). Previous clinical experience seems evenly distributed between those with academic and healthcare affiliations, while academic experience is more common in embedded researchers with academic affiliations (36.8% versus 27.6%) (Figure 3).

Insert Figure 3: Clinical and academic experience of current embedded researchers

In addition to being more research qualified, embedded researchers with a primary academic affiliation were also older than those with a primary healthcare affiliation. More embedded researchers with primary academic affiliations were aged between 51 and 60 (n=24, 46.2% versus n=17, 32.7%), and more embedded researchers with primary healthcare affiliations were aged between 41 and 50 (n=19, 36.5% versus n=11, 21.1%). Overall, the majority of embedded researchers were aged between 40 and 60 years (n=71, 68.2%) (Figure 4).

Insert Figure 4: Embedded researcher age

Where are embedded researchers situated in the healthcare organisation?

Over half of embedded researchers with a primary academic affiliation were employed at Professor level (n=27, 51.9%), 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%). In contrast, the majority of embedded researchers with a primary healthcare affiliation identified as a 'clinician researcher' (n=34, 68%). The remaining were employed in middle management roles (n=6, 12%), senior/executive management (n=5, 10%), mixed management and clinical practice (n=4, 8%), and project management (n=1, 2%). A greater variety of role titles were reported by healthcare affiliated embedded researchers including clinical lead, research lead, clinical midwife or nurse consultant, clinical/clinician researcher, clinical research consultant, researcher/translational researcher/patient safety researcher, research manager, research coordinator, (senior) research officer, (senior) research fellow, (senior) research associate, research chair, (conjoint) Professor, (conjoint) A/Prof and clinical academic.

When asked which groups they felt they belonged to within the healthcare organisation, the majority of embedded researchers (68%, n=66, N=97) indicated that they belonged to the clinical department(s) in which they were embedded, 39 (40.2%) identified a research or quality improvement unit, and 8 (8.2%) indicated they did not belong to any group. Of those who indicated they belonged to a clinical group or groups, 16 (16.5%) indicated that they also belonged to a research/improvement unit or network. In terms of the research/improvement units or networks, embedded researchers described these groups as research institutes, research teams, research networks, research governance, research management, research and education, clinical governance and research, health promotion research, clinical trial group, and quality and safety. Embedded researchers who do not see themselves as belonging to a specific group stated that they provide research support across the healthcare organisation. There was no meaningful difference in relation

to the groups embedded researchers felt they belong to between those with a primary academic versus healthcare affiliation.

Most embedded researchers have clear reporting lines in their organisation and there was a greater number and variety of named line managers in healthcare organisations compared to academic ones. It appears that most embedded researchers reported to a director or named manager/head of a specific clinical service area. A smaller proportion reported to executives, research directors or quality managers. Some identified dual reporting expectations.

Most embedded researchers managed staff (n=59, 59%). Embedded researchers reported managing a range of between 1 and 15 staff in clinical, administrative, research assistant/coordinator and project officer positions as well as postgraduate students. Embedded researchers with a primary academic affiliation more likely to manage other people than those with a primary healthcare affiliation (n=35, 70% versus n=24, 48%).

What is the role of embedded researchers in healthcare organisations?

The majority of embedded researchers indicated that they engaged in personal research (n=89, 89%), clinical team/group's research (n=89, 89%, N=100), networking and linking people together (n=82, 82%), capacity building (n=81, 81%), project management (n=71, 71%), and information management (n=34, 34%). Embedded researchers with a primary academic affiliation are significantly more likely to network and link people together (90% versus 74%), and build capacity (92% versus 70%), but less likely to manage information (28% versus 40%) (Figure 5).

Insert Figure 5: Research activities of embedded researchers

Embedded researchers were asked to rate 5 statements in relation to their role and describe the frequency of their experience on 3 statements. The patterns of reporting between embedded researchers with primary academic and healthcare affiliations were very similar, predominantly positive and there were no statistically significant differences. In terms of their role, the two statements that were most highly rated were “I establish collaborative relationships between clinical and academic teams” (41.2% indicated always, mean 4.1) and “I design research with stakeholders so that it will be relevant to local end users” (40.2% indicated always, mean 4.1). The most poorly rated statement was “I suggest strategies for clinicians to apply research findings in their practice” (25.8% indicated always, mean 3.8) followed by “I engage clinicians to explore problems where clinical practice is not consistent with research findings” (33% indicated always, mean 3.9) (Figure 6, Table 1).

In terms of the experience of embedded researchers of their role, 23.7% always felt “supported by clinical managers to pursue research activity” (mean 3.6), 28.9% always felt “valued and respected by clinical colleagues for my research contribution” (mean 3.7), and 35.1% always felt recognised for building research capacity of clinicians I am working with (mean 3.8) (Figure 6, Table 1).

Insert Figure 6: The experience of working as an embedded researcher (%)

Insert Table 1: The experience of working as an embedded researcher: Comparison by affiliation

The research environment and culture of healthcare organisations

In relation to the research culture of the healthcare organisations, the vast majority of embedded researchers indicated that research is a strategic objective of the healthcare organisation (85.9%,

n=85, N=99), in particular those with a primary academic affiliation (93.88% versus 78%). However, when asked which research outputs were measured by the healthcare organisation, 19% (n=19, N=100) responded that research outputs were not measured, and a further 12% (n=12) indicated that they did not know. The remaining 69 (69%) indicated that a range of research outputs were measured, including published papers (n=66, 66%), grants awarded (n=63, 63%), ethically approved projects (n=46, 46%), conference papers (n=45, 45%), higher degree student supervision (n=43, 43%), conference posters (n=37, 37%), and other (n=5, 5%). The 'other' outputs recognised include number of adjunct and conjoint positions, research awards, research impact and translation into practice (e.g. patents and clinical guidelines) (Figure 7).

Insert Figure 7: Research outputs measured

Embedded researchers were asked to rate a number of statements in relation to the healthcare organisation from disagree to agree. The statements that were most positively rated were "Clinical practice that is informed by research is valued" (60.2% agreed, mean 3.5), "Research is initiated by personal/career agenda of the researcher" (53.8% agreed, mean 3.3), "There is a commitment to research in this organisation" (48.4% agreed, mean 3.4), and "Health services research is recognised and valued" (47.3% agreed, mean 3.3). The statements that were most poorly rated were "Resources are available to support individual researchers" (28% agreed, mean 2.5) and "Research is initiated or informed by epidemiological and qualitative determined priorities" (28% agreed, mean 2.7) (Figure 8, Figure 10, Table 2).

Insert Figure 8: Research culture of the healthcare organisation

As indicated in Table 2, the responses between embedded researchers with a primary healthcare affiliation and those with a primary academic affiliation were similar (not statistically significantly different).

Insert Table 2: Research culture of the healthcare organisation: Comparison by affiliation

The experience of having a dual affiliation

Sixty-nine (66.3%) of embedded researchers had a dual affiliation. Of these, 59 (59.6%) had a formal conjoint appointment, with this proportion higher for embedded researchers with a primary academic affiliation (75%, n=39 versus 44.2%, n=23). In relation to their experience of a dual affiliation, respondents with a dual affiliation were asked to rate 4 statements on a scale from disagree, sometimes, agree and unsure/NA (N=59, 14 with a primary healthcare affiliation and 45 with a primary academic affiliation).

Nearly two third (n=38, 64.4%) agreed with the statement “Co-production of research is valued by both organisations”, with this proportion higher for those with an academic affiliation (66.7% versus 57.1%). Over half (n=36, 61%) agreed with the statement “My research achievements in the clinical organisation are valued and celebrated by the academic institution”, with little difference based on affiliation. Just under half (n=29, 49%, N=59) agreed with the statement “I struggle to manage the demands of both the clinical and academic organisations”, with no difference based on primary affiliation. Just over a quarter (27%, n=15) agreed with the statement “The expectations of me of the clinical and academic organisation are often in conflict”, again with no difference based on affiliation.

Insert Table 3: Experience of having a dual affiliation by primary affiliation (N=59)

Discussion

The history of embedded researchers in Australian healthcare extends beyond 16 years, however, almost half of respondents had been in their role for less than 2 years. While the model has originally been supported and maintained by academic organisations, it appears that healthcare organisations have invested most heavily over the last 5 to 10 years. Embedded researchers are aged between 40 and 60 and bring considerable academic and clinical experience to the role. Almost half of respondents reported having more than 16 years of clinical experience, and a third reported over 16 years of academic experience. The majority had a PhD or research masters. Respondents were relatively equally distributed across medicine (n=27), nursing and midwifery (n=37) and allied health (n=36), and a small number were from a non-health specific discipline such as social science. Most embedded researchers belonged to a clinical department and/or research or quality improvement unit. A small proportion reported not belonging to any group and described providing research support across the healthcare organisation. An equal number of embedded researchers reported a primary academic versus a primary healthcare affiliation, and 60% had a formal conjoint appointment.

While overall the differences between embedded researchers with a primary academic affiliation versus healthcare affiliation were minimal, respondents with a primary academic affiliation were more research qualified, had more research experience, were older and had been in the role longer. While previous clinical experience was evenly distributed between those with academic and healthcare affiliations, respondents with a primary academic affiliation reported greater academic experience. In terms of research qualifications, only 3.8% (n=2) of those with a primary academic

affiliation did not have a PhD or Research Masters, compared to 13.5% (n=14) of those with a primary healthcare affiliation. In relation to age, more embedded researchers with primary academic affiliations were aged between 51 and 60 (46.2% versus 32.7%), and more embedded researchers with primary healthcare affiliations were aged between 41 and 50 (36.5% versus 21.1%). In terms of duration in the role, of embedded researchers who reported on a previous role, those with a primary healthcare organisation were significantly more likely to have been in the role for less than five years than those with a primary academic affiliation (60% versus 23.2%).

This finding that respondents with a primary healthcare affiliation were younger, less research qualified and experienced and had been in the role for less time highlights the need for embedded researchers to have access to academic support and mentoring, perhaps through formal conjoint affiliations. This is supported by our finding that 70% of embedded researchers with primary healthcare affiliation were fully funded by their healthcare organisation, and less than half had a dual affiliation with an academic organisation. For these embedded researchers, academic mentoring may not be easily accessible in a healthcare organisation, and they may benefit from a formal academic affiliation. The literature supports the importance of formal links and arrangements with academic institutions to develop and strengthen the embedded researcher model (10, 13, 14, 17).

In terms of the nature of the role, most embedded researchers described their role as including personal research, specific clinical research, networking, capacity building and project management, with similar responses between embedded researchers with primary academic and healthcare affiliations. Respondents were more likely to 'establish collaborative relationships between clinical and academic teams' and 'design research with stakeholders so that it will be relevant to local end users' but less likely to 'suggest strategies for clinicians to apply research findings in their practice'

and ‘to engage clinicians to explore problems where clinical practice is not consistent with research findings’.

Given the role of an embedded researcher is to promote evidence-based practice, this finding is concerning, though not surprising. We suspect that there is an incentive to engage in research generating activities that are measured within the traditional academic performance matrices. Despite their importance to promoting evidence-based practice, implementation and capacity building activities are often not prioritised. These activities are often more complex and difficult to achieve and measure success in. As such it is not surprising that they may gravitate towards activities that are most likely to generate traditional academic outputs to meet academic KPIs.

This incentive to prioritise traditional academic outputs is further reinforced by the healthcare organisation. While 31% of respondents reported that research outputs were not measured, or that they did know which outputs were measured, the remainder indicated that only traditional research outputs were measured such as publications and grants awarded. Even though the healthcare organisations had invested financially in these roles (at a minimum of 30%), outputs that are more sensitive or appropriate to the healthcare organisation were not measured. There is a need for healthcare organisations to better understand, identify, measure and report components of evidence translation and capacity building initiatives.

While the purpose of the embedded researcher role is to support evidence translation, unless ‘evidence translation’ or ‘knowledge brokering’ activities (29, 30) are clearly documented and measured, there is a risk that traditional academic outputs (or clinical work) will be prioritised. Half (49%) of respondents reported that they struggled to manage the demands of both the clinical and academic organisation, and just over a quarter (27%) felt that the expectations of the clinical and academic organisation were often in conflict. This notion that academic and healthcare

organisations have different priorities is well established (31, 32), and KPIs for the embedded researcher role need to be developed that meet the needs of the academic and clinical organisation.

Clearly defining the scope of the role as a healthcare resource, with agreed upon KPIs, may also help improve the research culture of the organisation. While most indicated that research is a strategic objective of the healthcare organisation (85.9%), and that clinical practice that is informed by research was valued (60%), only 28% agreed that adequate resources were available. Less than a quarter (23.7%) felt consistently supported by clinical managers to pursue research activity, 28.9% always felt valued and respected by clinical colleagues for my research contribution 35.1% felt consistently recognised for building research capacity. While patterns of reporting were similar between those with primary academic versus healthcare affiliations, embedded researchers with a primary academic affiliation were more likely to indicate that research was a strategic objective of the healthcare organisation (93.9% versus 78%) and more likely to agree that research was initiated or informed by epidemiological and qualitative determined priorities of the healthcare organisation (mean 2.4 versus mean 3.0) and that co-production of research is valued (66.7% versus 57.1%).

By comparing responses from respondents with a primary academic versus healthcare affiliation this study provides insights into the experience of different levels of 'embeddedness' or different ways in which the models is implemented. While it is sometimes suggested that embedded researcher models where the researcher is fully immersed in healthcare may be most effective to support evidence translation (as by being fully immersed provides access to contextual information not readily available to outsiders) (9, 10, 20), our findings indicate a need for caution. Fully embedded researchers are less research trained and experienced, and feel less supported in their research activities than those with primary academic affiliations. To support implementation researchers in healthcare settings, there is a need for more research structures and supports to be developed.

Though critical to support evidence translation, the development of partnerships between healthcare and academia is complex and fraught with challenges, and how such partnership can best support evidence translation remains unclear (31, 32). While the embedded researcher model appears to have merit (12, 14, 21), it is associated with a range of challenges as researchers, clinicians, and health service managers have different agendas, ways of working, priorities and timeframes, which can be in conflict (14, 33). As also pointed out by others, our findings suggest that to support the embedded researcher model, broader system changes at both the research and practice level are required (9, 20, 33).

This study has a number of limitations, in particular its modest sample size and limited ability to be generalised. Given our modified snowball sampling approach, we do not know how many embedded researchers were invited to participate, so it is unclear what percentage of the potential respondents contacted participated. Furthermore, as we asked respondents to self-identify as embedded researchers, it is possible that some respondents did not fully meet our criteria, however, our findings suggest that the vast majority had capacity building as part of their role. Also, some of the respondents were no longer embedded researchers at the time of participation, which may have affected recall. Lastly, the psychometric properties of the survey were not assessed, so the validity of the survey tool used is unclear.

Despite these limitations, this exploratory study provides important insight into how the embedded researcher model has been implemented in Australian healthcare settings and contributes to the discussion around the degree of embeddedness (12, 21). There is a need for further research to gain deeper insight into the experiences of embedded researchers, how the model is best implemented, and to gain a better understanding of the benefits and challenges of having a dual affiliation.

Conclusion

The diversity of the embedded researcher role is not currently known and this study provides an important description of its current status in Australia. While the embedded researcher model has potential to support evidence translation, there is a paucity of supporting literature. This study contributes to the literature by mapping how the model is adopted in Australian healthcare settings, and identifying the differences in the role and the experience of the role based on primary affiliation. By providing an overview of how the embedded researcher model is adopted in the Australian context, this study provides a starting point for healthcare organisations and academic institutions to partner in the further development and implementation of this model.

Acknowledgments

The authors have read the journal's policy on disclosure of potential conflicts of interest and have no conflicts of interest to declare. All authors have read the journal's authorship agreement. The manuscript has been reviewed by and approved by both authors.

Tables

Table 1: The experience of working as an embedded researcher: Comparison by affiliation

Statement	Mean Healthcare affiliation (N=49)	Mean Academic affiliation (N=48)	z-value (Mann-Whitney) academic/healthcare	P-value academic/healthcare
The embedded researcher role				
I establish collaborative relationships between clinical and academic teams	4	4.2	-1.62	0.10
I engage clinicians to explore problems where clinical practice is not consistent with research findings	3.9	3.9	-0.57	0.56
I design research with stakeholders so that it will be relevant to local end users	4.1	4.2	-0.73	0.46
I suggest strategies for clinicians to apply research findings in their practice	3.8	3.8	-0.17	0.86
I work with clinicians to identify clinically important research questions	3.9	3.7	-1.37	0.17
The embedded researcher's experience				
I feel supported by clinical managers to pursue research activity	3.5	3.7	-0.53	0.59
I feel valued and respected by clinical colleagues for my research contribution	3.6	3.9	-1.50	0.13
I am recognised for building research capacity of clinicians I am working with	3.7	3.9	-0.41	0.68

Table 2: Research culture of the healthcare organisation: Comparison by affiliation (N=93)

Statement	Mean Healthcare	Mean Academic	z-value	p-value
There is a commitment to research in this organisation	3.3	3.5	-1.62	.10
Clinical practice that is informed by research is valued	3.5	3.5	-.24	.80
Research is a regular topic of discussion at the executive	3	3.1	-.59	.55
Co-production of research with academic partners is valued	3.1	3.3	-1.15	.24
Health services research is recognised and valued	3.1	3.4	-1.75	.08
Resources are available to support individual researchers	2.5	2.6	-.68	.49
Research is initiated or informed by epidemiological and qualitative determined priorities of the healthcare organisation	2.4	3	-2.6	.009*
Research is initiated by personal/career agenda of the researcher	3.3	3.3	-.17	.86

*while significant a $P > 0.05$, when adjusted using the Bonferroni correction for multiple testing, significance was set at $P < 0.006$ and this findings is not significant.

Table 3: Experience of having a dual affiliation by primary affiliation (N=59)

	All (N=59) %*	Primary healthcare affiliation %* (N=14)	Primary academic affiliation %* (N=45)
Co-production of research is valued by both organisations	64.4	57.1	66.7
My research achievement in the clinical organisation are valued and celebrated by the academic institution	61	64.3	60
I struggle to manage the demands of both the clinical and academic organisation	49.2	50	48.9

The expectations of me of the clinical and academic organisation are often in conflict	27.1	28.6	26.7
--	------	------	------

* Percentage of respondents that agreed with this statement

Figures

Figure 1: % paid for by healthcare organisation

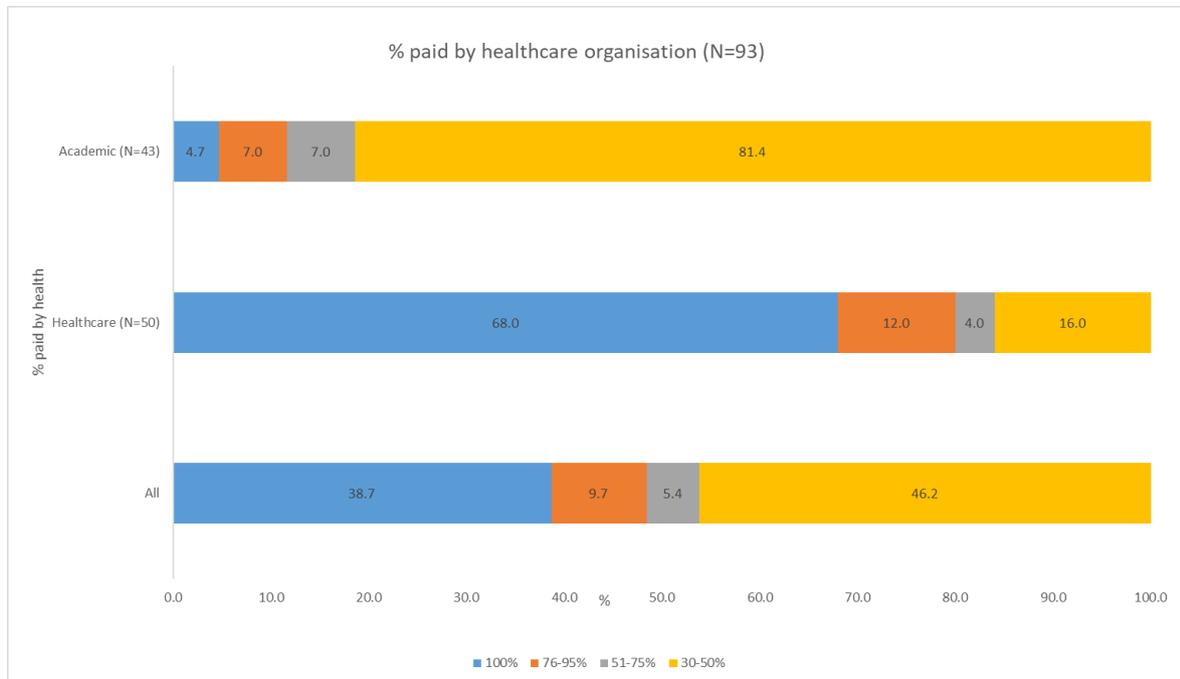


Figure 2: Duration in role

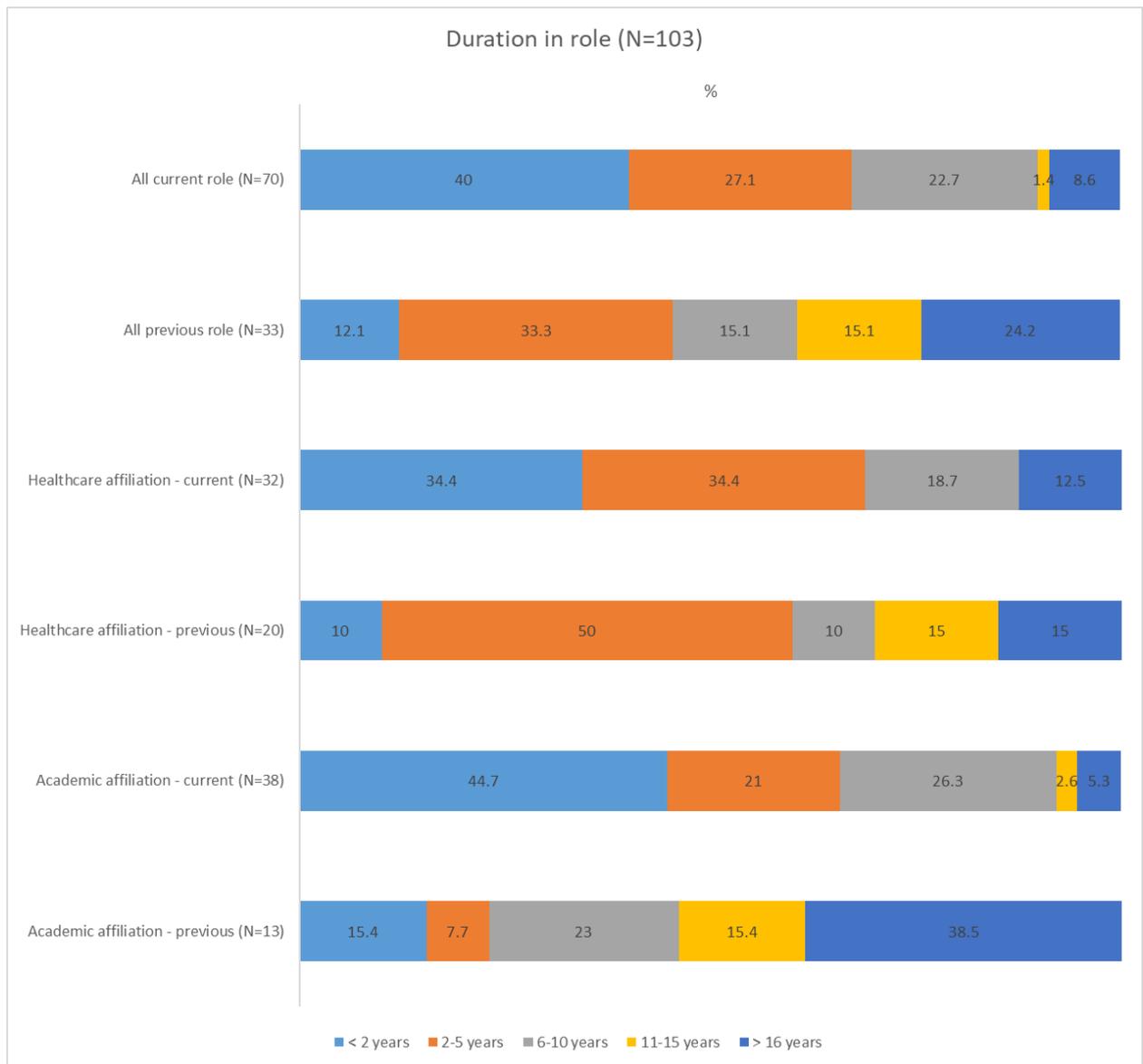


Figure 3: Clinical and academic experience of current embedded researchers

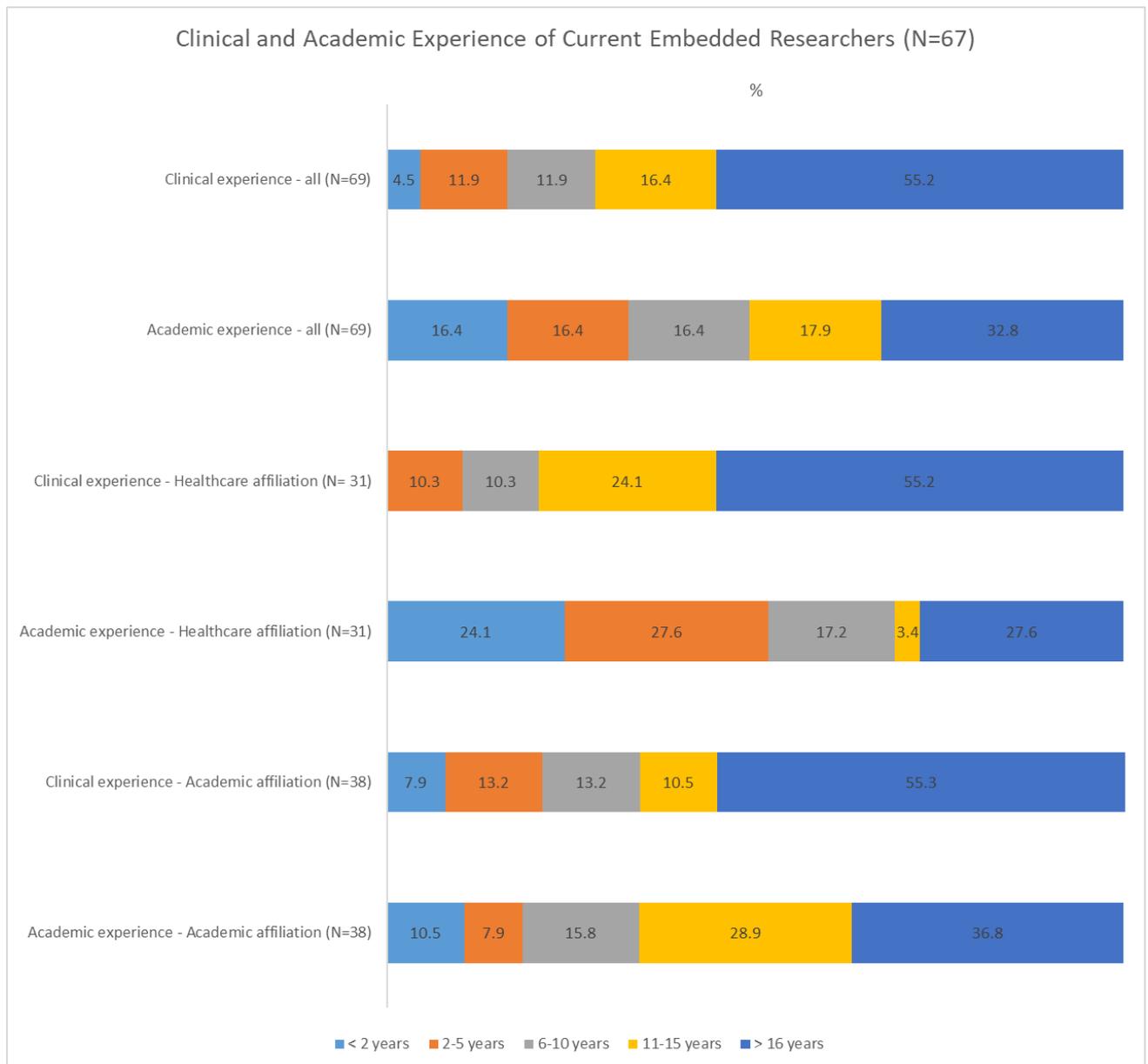


Figure 4: Embedded researcher age

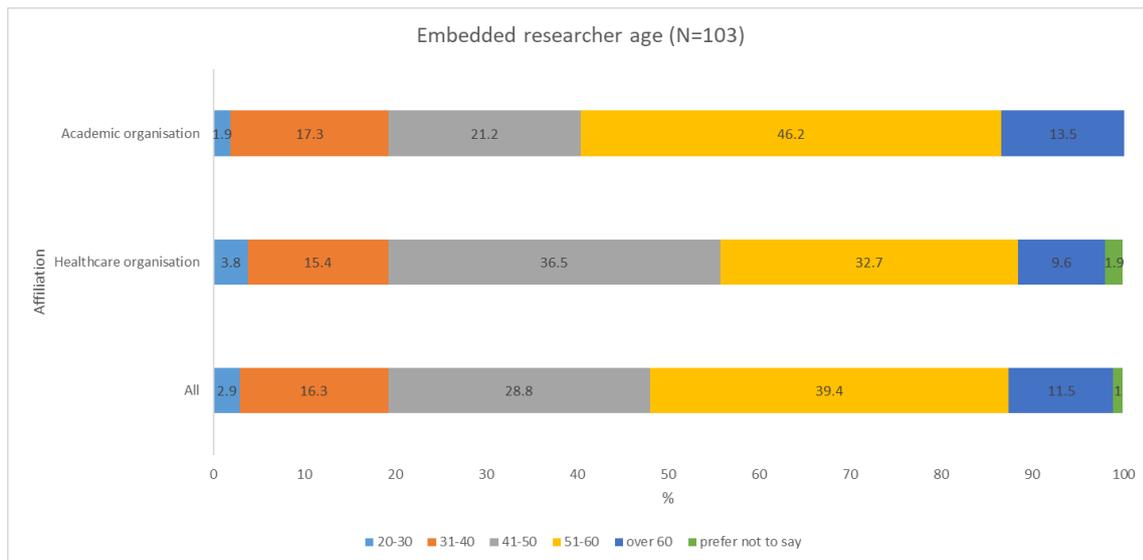


Figure 5: Research activities of embedded researchers

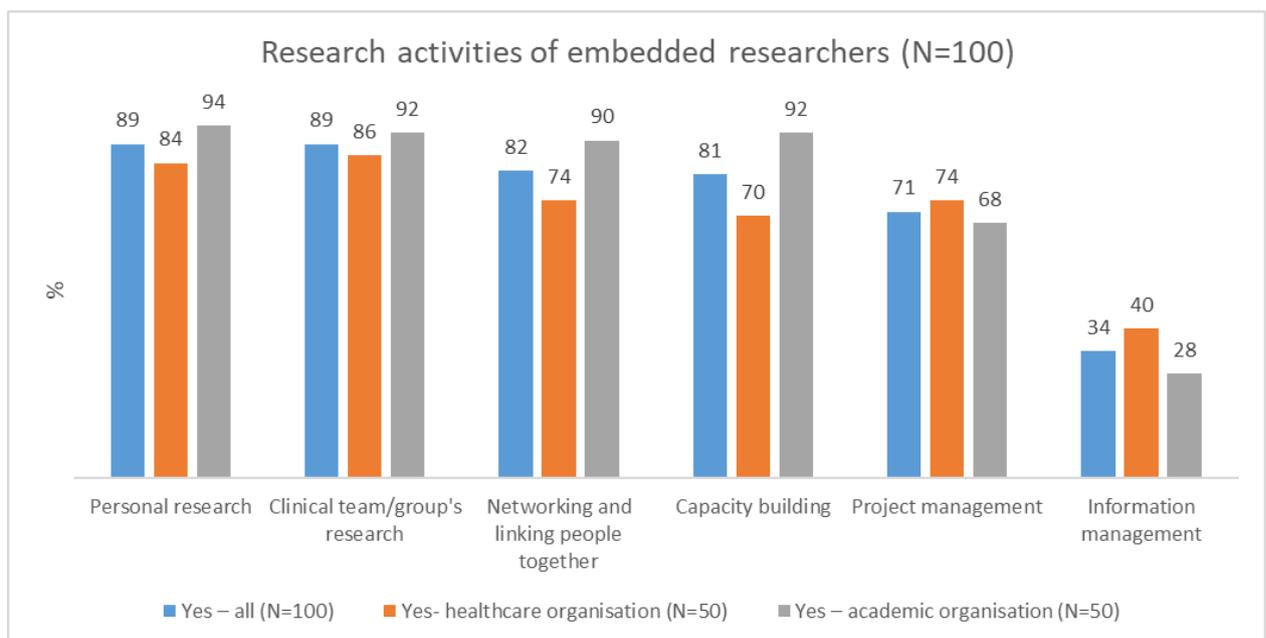


Figure 6: The experience of working as an embedded researcher (%)

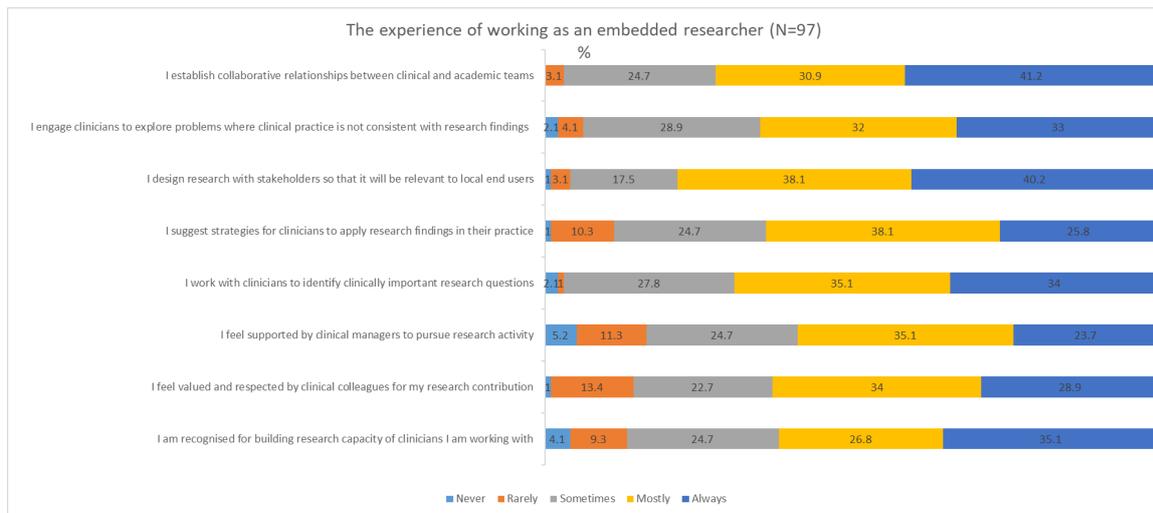


Figure 7: Research outputs measured

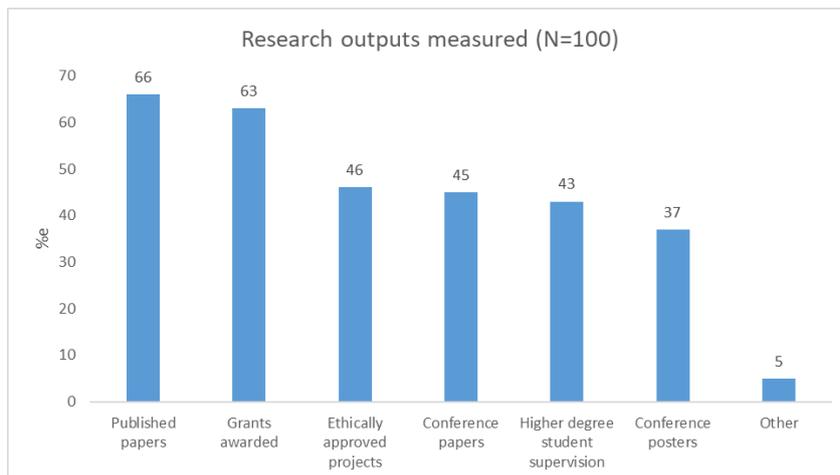
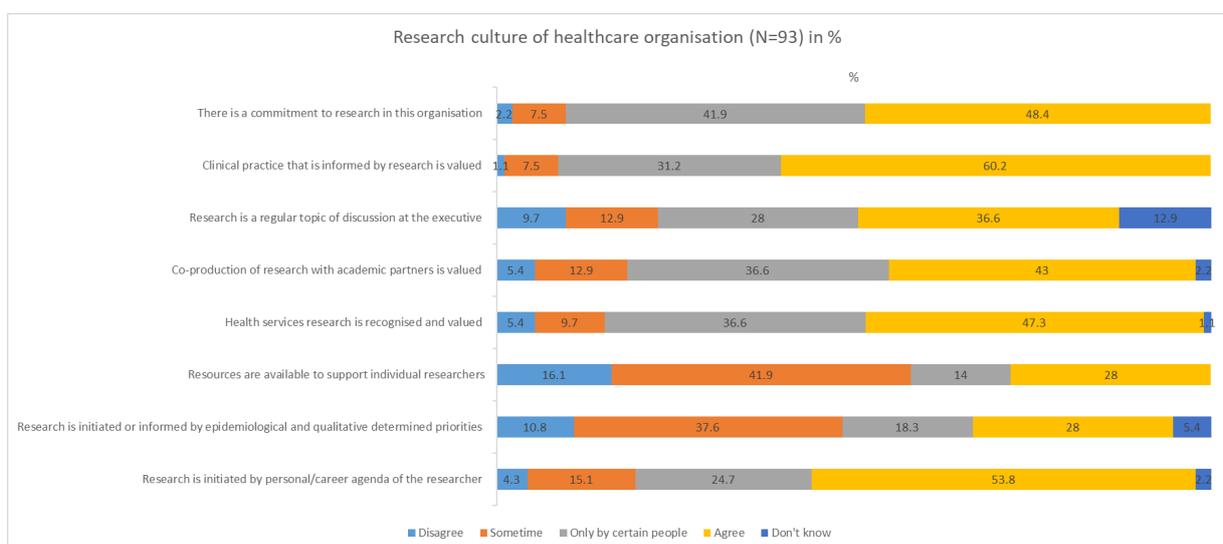


Figure 8: Research culture of the healthcare organisation



References

1. Curtis K, Fry M, Shaban RZ, Considine J. Translating research findings to clinical nursing practice. *Journal of clinical nursing*. 2017;26(5-6):862-72.
2. Runciman W, Hunt T, Hannaford N, et al. CareTrack: assessing the appropriateness of health care delivery in Australia. *Medical Journal of Australia* 2012;197(549).
3. Miller S, Abalos E, Chamillard M, et al. Beyond too little, too late and too much, too soon: a pathway towards evidence-based, respectful maternity care worldwide. *The Lancet*. 2016;388(10056):2176-92.
4. Marshall M. Bridging the ivory towers and the swampy lowlands; increasing the impact of health services research on quality improvement. *International Journal for Quality in Health Care*. 2014;26(1):1-5.
5. Bannister J, Hardill I. Knowledge mobilisation and the social sciences: dancing with new partners in an age of austerity. *Contemporary Social Science*. 2013 2013/11/01;8(3):167-75.
6. Barnes R, Holmes B, Lindstrom R, Trytten C, Wales M. Evidence-informed healthcare through integration of health research. *Healthcare Management Forum*. 2015;28(2):75–8.
7. Rycroft-Malone J, Wilkinson J, Burton C, et al. Collaborative action around implementation in Collaborations for Leadership in Applied Health Research and Care: Towards a programme theory. *Health Services Research & Policy* 2013;18(3):13–26.
8. Nyström ME, Karlton J, Keller C, Andersson Gäre B. Collaborative and partnership research for improvement of health and social services: researcher's experiences from 20 projects. *Health research policy and systems*. 2018;16(1):46-.
9. Marshall M, Pagel C, French C, et al. Moving improvement research closer to practice: the Researcher-in-Residence model. *BMJ Quality & Safety*. 2014;23(10):801-5.
10. Lewis S, Russell A. Being embedded: A way forward for ethnographic research. *Ethnography*. 2011;12(3):398-416.
11. McGinity R, Salokangas M. Introduction: 'embedded research' as an approach into academia for emerging researchers. *Management in Education*. 2014 2014/01/01;28(1):3-5.
12. Churrua K, Ludlow K, Taylor N, et al. The time has come: Embedded implementation research for health care improvement. *Journal of Evaluation in Clinical Practice*. 2019;25:373-80.
13. Vindrola-Padros C, Eyre L, Baxter H, et al. Addressing the challenges of knowledge co-production in quality improvement: learning from the implementation of the researcher-in-residence model. 2019;28(1):67-73.
14. Vindrola-Padros C, Pape T, Utley M, Fulop NJ. The role of embedded research in quality improvement: a narrative review. *BMJ Quality & Safety*. 2017;26(1):70-80.
15. Wong S. Tales from the frontline: the experiences of early childhood practitioners working with an 'embedded' research team. *Evaluation and program planning*. 2009 May;32(2):99-108.
16. Marshall M. Researchers-in-Residence: a solution to the challenge of evidence-informed improvement? *Primary Health Care Research & Development*. 2014;15(4):337-8.
17. Reiter-Theil S. Does empirical research make bioethics more relevant? "The embedded researcher" as a methodological approach. *Medicine, Health Care and Philosophy*. 2004 April 01;7(1):17-29.
18. Priscilla P, Peter W-C, Anke S. Challenging our own practices in Indigenous health promotion and research. *Health Promotion Journal of Australia*. 2008;19(3):179-83.
19. Hentschel R, Lindner K, Krueger M, Reiter-Theil S. Restriction of Ongoing Intensive Care in Neonates: A Prospective Study. *Pediatrics*. 2006;118(2):563-9.
20. Tran N, Langlois E, Reveiz L, et al. Embedding research to improve program implementation in Latin America and the Caribbean. *Rev Panam Salud Publica*. 2017;e75:41.

21. Barry D, Kimble L, Nambiar B, et al. A framework for learning about improvement: embedded implementation and evaluation design to optimize learning. *International journal for quality in health care : journal of the International Society for Quality in Health Care*. 2018;30:10-4.
22. Bolarinwa O. Principles and methods of validity and reliability testing of questionnaires used in social and health science researches. 2015 October 1, 2015;22(4):195-201.
23. Babbie E. *The practice of social research*. Belmont, CA: Wadsworth, Thomson Learning; 2001.
24. Babbie E. *The practice of social research*. Belmont, CA: Wadsworth, Thomson Learning; 2004.
25. Holloway I, Wheeler S. *Qualitative Research in Nursing* 2nd ed. Oxford: Blackwell Publishing 2002.
26. Bryman A. *Social research methods*. New York: Oxford University Press; 2001.
27. Crabtree BF, Miller WL. *Doing qualitative research: research methods for primary care* Newbury Park, California: Sage Publications; 1992.
28. Bland J, Altman D. Multiple significance tests: the Bonferroni method. 310. 1995;170(BMJ).
29. Bornbaum CC, Kornas K, Peirson L, Rosella LC. Exploring the function and effectiveness of knowledge brokers as facilitators of knowledge translation in health-related settings: a systematic review and thematic analysis. *Implementation Science*. 2015 2015/11/20;10(1):162.
30. LaRocca R, Yost J, Dobbins M, Ciliska D, Butt M. The effectiveness of knowledge translation strategies used in public health: a systematic review. *BMC Public Health*. 2012 2012/09/07;12(1):751.
31. Gagliardi AR, Berta W, Kothari A, Boyko J, Urquhart R. Integrated knowledge translation (IKT) in health care: a scoping review. *Implementation Science*. 2016 2016/03/17;11(1):38.
32. Kothari A, Wathen CN. Integrated knowledge translation: digging deeper, moving forward. 2017;71(6):619-23.
33. Marshall M, Eyre L, Lalani M, et al. Increasing the impact of health services research on service improvement: the researcher-in-residence model. *Journal of the Royal Society of Medicine*. 2016;109(6):220-5.