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Using knowledge brokering activities to promote allied health clinicians' engagement in research: a qualitative exploration

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ABSTRACT

Introduction Engaging clinicians in research can improve healthcare organisational performance, patient and staff satisfaction. Emerging evidence suggests that knowledge brokering activities potentially support clinicians' research engagement, but it is unclear how best they should be used.

Objectives This study explores how embedded researchers utilised knowledge brokering activities to engage research interested clinicians in research.

Design A longitudinal qualitative interview based study was co-designed to investigate how experienced research fellows utilise knowledge brokering activities to facilitate allied health clinicians' engagement in research.

Setting In one large tertiary level, regional Australian health service, research fellows were matched with research interested clinicians.

Methods Qualitative analysis of three longitudinal semi-structured interviews for each research fellow was undertaken. Initial descriptions of their utilisation of knowledge brokering activities were deductively coded. Reflexive thematic analysis was utilised to generate a shared explanation of clinicians' engagement in research.

Results Three research fellows facilitated 21 clinicians' participation in and leadership of clinical research projects over 12 months. They utilised all ten key knowledge brokering activities with each clinician, with differing patterns and examples. Research fellows described using linkage and exchange activities of communicating and collaborating with key stakeholders, and they tailored knowledge management products for individual's engagement. Further, they described a broader learning journey where they clarified and monitored individuals' capabilities, motivation and their contextual support for research engagement.

Conclusion When research fellows chose and tailored knowledge brokering activities to align and extend clinicians' research capabilities and motivation, they created individualised learning curriculums to support clinicians' participation in and leadership of local research projects. Health and academic leaders should consider structuring embedded researcher positions to include knowledge brokering roles and activities, specifically for research interested clinicians who are ready to participate in and lead research projects.

Strengths and limitations of this study

► Embedded researchers were reflexively engaged in codesigning the study and interpreting the results.
► A small sample of embedded researchers described how they used knowledge brokering strategies, using longitudinal in-depth exploration of multiple narratives.
► Focused only on allied health clinicians within one health service at a point in time when there was management support for professorial and senior research fellow positions.
► Focused on relationships between embedded researchers and clinicians, without full investigation of organisational context.

INTRODUCTION

Engaging healthcare clinicians and organisations in research can improve healthcare organisational performance, patient outcomes, and staff satisfaction and retention.[1–3] To date, most research has linked organisational research engagement, through collaborative partnerships, with improved healthcare performance. However, there is a growing interest in supporting clinicians' ability and willingness to use and participate in research.[3–5] Clinicians often have multiple competing priorities which may limit their engagement in research. Lack of time, organisational and managerial support are commonly reported barriers, while clinically relevant and personally meaningful research are noted facilitators. Further, clinicians' research knowledge and confidence can also influence their engagement.[5–9] Consequently, an increasing array of theoretical and practical activities have emerged to enhance the ability and willingness of health professionals to use, participate in and lead research.[10 11] The concept of a linear pipeline between the

creation and application of research has been superseded by systems and complexity thinking.[12 13]

Within this complexity, embedded research positions show promise as a strategy to build the research capacity of clinical staff to produce relevant research and generate sustainable practice improvements.[11 14–20] Specifically, when experienced researchers are employed in stable and accessible positions with leadership support and access to appropriate resources, they can enhance the workplace culture, support clinicians' professional development and generate clinical service improvements.[14] While the potentials and challenges of bringing researchers and clinicians together are being documented, it is still unclear how embedded researchers can best support clinicians to engage in research.[4 5 9 11]

Knowledge brokering has been described as an iterative process of translation and tailoring of information, that can inform the work of embedded researchers.[9 21] Knowledge brokering tasks include a range of capacity building, facilitation, engagement and support activities that emphasise the human component of engaging with research.[22–24] Three theoretical models inform the core functions of knowledge brokering.[22 23 25 26] First, knowledge management theory emphasises the systematic creation and diffusion of knowledge, where information is organised and packaged so it is relevant for clinicians.[22 25] Second, the linkage and exchange model highlights the dynamic interface between creators and users of knowledge. These tasks focus on interpersonal networks and highly developed communication and facilitation skills which facilitate collaboration between clinical and academic settings.[23 25] Last, the social change framework informs capacity building, where activities are designed to develop users' knowledge and skills, and their ability to access and apply knowledge for evidence-informed decision making.[22 25] These three theoretical functions underpin 10 key knowledge brokering activities[22 23] (see table 1). Different combinations of knowledge brokering activities have been reported to be used together to achieve positive changes in organisations and clinicians' knowledge, skills and practice.[22 24 27–29]

While most research has investigated the organisational impact of knowledge brokering, this study will investigate how embedded researchers use knowledge brokering activities, in addition to traditional mentoring and facilitation activities, to engage individual clinicians in research.[24] Most research to date has focused on encouraging clinicians to engage with and to use research.[3] Therefore, this study was designed to explore how research fellows used knowledge brokering activities to support clinicians' engagement in research, that is participating in and leading research projects.[3 9 22] This study investigates how the 10 key knowledge brokering activities were enacted by embedded researchers and aims to explain how knowledge brokering activities support individual clinicians' engagement in local research.

METHODS AND ANALYSIS
Study design
This study was part of a larger mixed-methods research project that was designed to explore strategies for research engagement of clinicians in allied health.[30] A longitudinal, qualitative study used semistructured interviews to explore embedded researchers' personal reflections about using knowledge brokering activities. We sought novel insights about supporting research interested clinicians' engagement with clinically important research.

Setting
In one large tertiary level, regional Australian health service, experienced embedded allied health researchers (referred to as research fellows) were matched with research interested allied health clinicians (referred to as clinicians). These clinicians volunteered to participate in and/or lead a local clinically relevant research project and had their managers' support to participate.[14 30] The matching process incorporated complimentary content

Table 1 Key knowledge brokering activities mapped to theoretical domains[22]

Knowledge brokering activities	Theoretical functions		
	Knowledge management	Linkage and exchange	Capacity building
Identify, engage and connect with stakeholders		x	
Facilitate collaboration		x	
Identify and obtain relevant information	x	x	x
Facilitate development of analytic and interpretive skills	x	x	x
Create tailored knowledge products	x	x	
Project coordination	x	x	
Support communication and information sharing	x	x	x
Network development, maintenance and facilitation		x	
Facilitate and evaluate change	x	x	x
Support sustainability			x

expertise, methodological skills, time and availability. The first four activities described in the published protocol were adhered to and outputs documented.[30] Individual case studies have yet to be published and this study represents the process evaluation from the research fellows' perspective, which may contribute to a future programme theory.

Participants

All three research fellows working in the health service at the beginning of 2016, were invited to codesign and consented to participate in this study. They formed a unique purposive sample of clinically experienced allied health clinicians who had completed PhD studies within the last 3–7 years. They were all employed full time in the health service and spent 50% of their time on research capacity building activities. Over a period of 12 months, research fellows chose appropriate and complementary activities from the 10 key knowledge brokering activities (table 1), to facilitate clinicians' engagement in a local research project.[22]

To counter a small sample size, this study adopted a specific aim to explore the application of knowledge brokering theory and practice at a specific time and place. Strong dialogue and longitudinal in-depth exploration of multiple narratives were included to maximise its informational power.[31]

Data collection

As active contributors to this study, all research fellows wrote reflective field notes for each interaction with their matched clinicians, including documenting their choice of knowledge brokering activities and describing key decisions and behaviours observed.[22] They participated in three longitudinal interviews of approximately 60 min duration each, over a 12-month period (once every 4 months).

Face-to face semistructured interviews were conducted by an independent researcher who was an experienced, trained interviewer, at a convenient workplace location chosen by each research fellow, during 2016–2017. The interview guide consisted of key prompts about how research fellows used all 10 knowledge brokering activities, together with open-ended questions about how the research fellows supported clinicians' engagement with research. The interview guides were provided to the research fellows before each interview, as a preparatory guide for reflection on their field notes. This semistructured interview guide was pilot tested in the initial interviews and validated, without change, through the remaining second and third interviews.

In the second and third interviews, research fellows were also asked to discuss changes in patterns of their use of knowledge brokering activities over time and in response to clinicians' progress in their local research projects. Additional open-ended follow-up questions were used to gain deeper insights as the interviewer took the stance of a naïve inquirer.[32]

Data analysis

Interviews were transcribed and coded by the independent researcher, AB, and first author, SM. After each round of interviews, research fellows were sent their transcripts for verification. They also discussed as a group, their comparisons within and between their work with different clinicians. Reflexive thematic analysis was used across two phases, to generate a thorough description and explanation of how research fellows engaged clinicians in local research projects over 12 months.[33]

First, the individual patterns of use of knowledge brokering activities were coded deductively against the published knowledge brokering theory and practice.[22] The way in which each research fellow used knowledge brokering activities with each matched clinician was documented. The strength of this dialogue was enhanced as research fellows were encouraged to make comparisons about working with different clinicians, and they included both similarities and differences in their narrative descriptions. This cross-case analysis was initially described for each research fellow and then further developed through comparison across all research fellows. The aim was to generate realistic and pragmatic descriptions of how research fellows used the knowledge brokering activities.[31]

Second, a shared explanation was developed through deliberate and reflexive engagement between researchers and research fellows after each series of interviews.[33] Discussion of the progressive stories of clinicians' engagement in their research projects prompted inductive analysis of the use of specific theoretical functions of knowledge management, linkage and capacity building.[34] Comparisons were made within and between research fellows of their own explanations, informed by their own internal comparisons between clinicians and their progress in their research projects. This in-depth exploration across a range of different matched pairs of clinicians and research fellows enabled deep narrative explanations with high informational power.[31] Based on this discussion, a conceptual explanation of how research fellows used knowledge brokering functions to engage clinicians in local research projects was coconstructed.

RESULTS

Three research fellows facilitated 21 allied health clinicians to participate in and lead clinical research projects over 12 months. Clinicians represented the disciplines of dietetics, occupational therapy, physiotherapy, social work and speech pathology. Research projects included systematic reviews, audit projects and pilot clinical studies. Research fellows described using all 10 knowledge brokering activities with each clinician, with differing patterns and examples.

First, descriptive summaries of the 10 knowledge brokering activities are provided, as a comprehensive summary. Second, a shared explanation of the way in which the theoretical knowledge brokering functions

facilitated clinicians' engagement in research has been developed.

Utilisation of knowledge brokering activities
Detailed summaries follow of how research fellows used the 10 knowledge brokering activities over 12 months with different clinicians/projects.[22] Quotes from interviews with research fellows are included in italicised text to substantiate this description but have not been attributed to individuals to maintain their confidentiality.

Identify, engage and connect with stakeholders
Research fellows described being like an internal stakeholder, in scoping and establishing the best research team possible, based on the clinical project and the clinicians' expertise. At the outset, they initiated meetings to recognise and align stakeholders. During the projects, they facilitated critical discussion and often identified additional and strategic stakeholders. They also described guiding clinicians to engage with stakeholders, through preparatory and debriefing meetings, and made explicit the value of connecting. One participant commented: '*you don't always have the perfect research team to begin with [but]…identifying key stakeholders early is more effective.*'

Facilitating collaboration
Research fellows described setting up and facilitating regular research team meetings, to inform and engage stakeholders, build consensus and make decisions. They ensured that all members knew what was happening, had clear roles and expectations: '*my role is to encourage them to think about when they should be engaging with this person*'. Over time, clinicians took ownership of these team meetings and began to set agendas.

Identify and obtain relevant information
Initially, research fellows described providing access to relevant and practical information and resources: '*gently giving people readings to do along the way…explaining these are the reasons why this is important*'. Research fellows reminded clinicians about evidence-based practice and encouraged clinicians to use critical appraisal skills. As clinicians engaged in the research process, research fellows continued to connect them with relevant information and described facilitating clinicians to use and interact with appropriate and timely resources: '*it's trying to shortcut things for them, because we've got such short timeframes [and] you want to make sure they get a good outcome so that they're not disenchanted.*'

Facilitate development of analytic and interpretive skills
Research fellows described making assessments of clinician's knowledge and skills, and then tailoring specific guidance at the appropriate level and time, for each clinician, to meet the needs of their project: '*they're time poor and when they want to do something, they just want to make it specific to their project.*' They helped clinicians to address their own knowledge and skill gaps by: '*identifying what they need to know, then developing strategies to help them to meet those learning needs.*' Research fellows described facilitating analytical and interpretive skills throughout the lifetime of each project, with more time focused on data analyses and writing up phases.

Create tailored knowledge products
Research fellows created an individualised learning curriculum of research knowledge and skills for each clinician. They shared templates, checklists, online tutorials, guides and examples of previous work (eg, ethics applications), and aligned these to the clinician's knowledge and skills set in a timely manner: '*you have to go back to your original experiences and your own journey and [suggest the] tools and strategies that worked for you.*' When using existing resources, research fellows described providing specific assistance: '*even though there were steps, we tailored those to make it even more user-friendly*'. They also described a need to design their own resources: '*I created a suite of handouts around critical analysis tools and some worksheets …. that I could use all the time.*'

Project coordination
Research fellows noted that most clinicians had not led a research project before. Therefore, they initially adopted a coordinator role, overseeing the whole project and guiding clinicians to use project and time management tools. They helped clinicians manage tasks that operate concurrently and sequentially: '*if you give them [project management] tools and say, we're going to go one step at a time, then they can actively work on different areas and come back to you [as they complete each step]*'. Research fellows emphasised their role in helping clinicians manage their time: '*I assist clinicians by making them aware of the next stages that they need to plan for, and how long it might take*'. They recognised that timely guidance ensured success at each stage and increased clinicians' confidence, so they could understand: '*where we are on our timeline and what's got to happen next*'.

Support communication and information sharing
Research fellows described initiating regular meetings and gradually sharing with clinicians the importance and purpose of regular communication. Specific and timely guidance was noted as important to prevent new researchers from becoming overwhelmed: '*I think research is something that has to be engaged with at a micro level to achieve macro stuff …. otherwise, it's too overwhelming.*' They recommended clinicians share information about progress with key stakeholders, and over time, revisited their priorities to maintain engagement. Research fellows reminded clinicians to provide positive feedback to key stakeholder groups throughout the project: '*I'm mindful of highlighting positive things that are happening and acknowledging everyone's contribution, to keep the motivation*'.

Network development, maintenance and facilitation
Research fellows often introduced clinicians to researchers from their own networks: '*I tailored their network to achieve their goal of doing this research project*

within their everyday practice'. They encouraged clinicians to develop new networks through working and learning together: '*so by working on something together you're learning from and with each other'*. Research fellows emphasised the value of networks for sharing and building resources: '*helping people understand that if we don't share this, someone else is going to do exactly the same... and waste resources doing what we already know'*. Further, research fellows facilitated clinicians to balance competing demands, motivation and responsibilities within their networks: '*everyone's got different motivations, goals, responsibilities; you have to be mindful of that...someone might have a lot of other responsibilities'*. They encouraged clinicians to present locally, to create awareness of their work and to recognise that these discussions can lead to future collaborative opportunities.

Facilitate and evaluate change

Research fellows described needing to know clinicians well to align opportunities to facilitate individual change: '*if you're introducing them to something new, you have to monitor where they're at and how ready they are'*. They described their crucial role in helping clinicians set realistic research goals for their projects and using these goals to monitor and evaluate change: '*by relooking at those goals with clinicians and seeing which goals we are making good progress with … that's been helpful with ongoing evaluation of learning'*. Bringing clinical practice improvements to the attention of peers and their managers made it real and motivating to clinicians: '*making sure we're acknowledging to the clinician or to people around them, that they have had a change in skill set, and … we've effected a change [in practice] because of the work that they've done'*. Later in the research projects, research fellows also helped clinicians to assess readiness to change within their local context, before implementing research findings in practice.

Support sustainability

Research fellows described supporting individual sustainability through encouraging critical thinking, and reflective practice: '*it's easy when people ask you a question, to just give them the answer straight away…. but that doesn't help with their learning…instead, hold back a little and encourage them to reflect and think'*. They described multiple challenges to sustaining a clinician's engagement in their research project over time as an: '*interplay between having the motivation, opportunities and capability'*. It was acknowledged that sometimes both research fellows and clinicians were unsure of the organisational support for specific research projects and that some clinicians lacked the intrinsic motivation compared with those completing a research higher degree. Research fellows emphasised that sustainability is more likely if clinicians have a successful research experience: '*positive outcomes motivate you and enhance sustainability'*. Therefore, they felt responsible for codesigning the research project for success in the local context: '*you've got to work out in this clinical setting, what is reasonable in the time frame that we have… you've got to make sure that we get [the clinician] through to the end, as a good experience'*.

Further, clinicians needed to understand the progression of research within a clinical area: '*a good example of the progression from systematic review to survey of practice, to a clinical trial'*.

Shared explanation of how research fellows supported clinicians' engagement in research

In addition to using all 10 knowledge brokering activities, research fellows described facilitating an overarching and unique learning journey for each clinician. This journey was defined by the clinician's capability and motivation to do research. Research fellows also had to match the demands of each clinicians' local workplace context with those of their research project. This influenced the way in which research fellows selected knowledge brokering activities for each clinician. A corresponding pattern emerged in the way research fellows initiated linkage and exchange functions early and then facilitated knowledge management and capacity building functions to co-create individualised learning journeys for clinicians around their own research project

Clarify clinicians' capability and motivation to do research

To begin, research fellows reported clarifying clinicians' motivation to do research: '*it's about connecting with who they see themselves to be'*. For some clinicians, research was not part of their identity, there were few role models and uncertain longer-term career benefits. Research fellows also needed to monitor and evaluate each clinician's level of knowledge and skills to engage in research: '*if someone says they've done [it] before, then you think they're capable, but I must check whether they're doing it the way that I would expect them to do it'*.

Early on, research fellows actively initiated networks and set up research projects while also conceptualising the research process for each clinician: '*the learning curriculum is like the research journey from the idea formation through to dissemination'*. They initiated linkage and exchange functions, such as identifying and aligning stakeholders, establishing meetings and facilitating clinicians to connect and collaborate with stakeholders.

Following on, research fellows described aligning clinicians' readiness to engage with research before setting clear learning goals: '*identify their motivations for engaging in research and then connect that with the research project at hand'*. They identified appropriate research tasks within local projects: '*if you've made an assessment of the clinician's knowledge, skills and attributes, then you can design strategies that will ensure they achieve the next step'*.

Match demands of the workplace context with clinicians' research project

Further, research fellows reported needing to understand the workplace environment, with respect to competing demands and local supports: '*they have different amounts of opportunity, so it's crafting something they want to engage in but also what's achievable within the environment that they are in'*. They described facilitating knowledge management

activities of sharing relevant information, creating tailored knowledge products, providing specific assistance and project coordination. They reported providing encouragement, feedback and positive reinforcement around these knowledge management tasks: '*you have to look at the project, the person, their skillset and what needs to happen… and how they respond, because everyone's different'*. Research fellows emphasised maintaining a consistent facilitative role to build clinicians' confidence by: '*making it a positive learning environment, so they're more likely to want to engage in research and share positive experiences with their clinical peers'*.

Building individualised learning curriculums

Based on this individualised analysis, research fellows described choosing knowledge brokering activities carefully: '*based on the person, the project, the context and the barriers that have been identified'*. The choice of knowledge brokering activities needed to be responsive and timely: '*some clinicians work better when they go away and do something independently and others like to be shown how to do it and then try it themselves'*.

All research fellows described the need to anticipate '*what's going to come next*", respond "*to what unfolds, being mindful of who they are'* and have protective measures in place '*so they will still progress'*. They reported setting appropriate boundaries in relation to clinicians' work demands: '*working out who is going to be able to do the job and who's not'*. They described monitoring micro-cycles of progress for every clinician and providing just-in-time challenges to: '*meet the needs of the clinicians at the right time within the life of the project'*. Research fellows described using knowledge management and linkage and exchange activities to build research capacity, as they codesigned, with clinicians, activities to progressively complete their local research projects.

DISCUSSION

This study has used a reflexive thematic analysis to explore how three research fellows, working in a regional health service, used knowledge brokering activities to engage 21 research-interested clinicians in local research projects over 12 months. Research fellows described using all 10 knowledge brokering activities in a manner that was consistent with the descriptions generated from a seminal systematic review.[22] Further, they summarised facilitating individualised learning journeys for each clinician in which they initiated many linkage and exchange activities, facilitated knowledge management and interspersed capacity building roles. They described a complex and dynamic process of clarifying clinicians' capability and motivation to do research, and then matching demands of the workplace context with clinicians' research project. Ultimately research fellows chose knowledge brokering activities and roles to cocreate an individualised and contextualised learning curriculum for each clinician.

These deep narrative descriptions are aligned with and extend the current literature. This study supports the key

focus of knowledge brokering in making research in clinical practice more accessible to clinicians and researchers, while recognising that knowledge brokering does not need to be a unique and focused role.[23 25] Instead, the different underpinning theories and practical knowledge brokering activities can be enacted as part of the broad research engagement activities of embedded researchers.[9] Consistent with the complexity of health systems, this study does not offer a linear or singular best option for how knowledge brokering activities can be enacted.[13] Instead, it offers a nuanced description of how research fellows chose and coordinated knowledge brokering activities in their facilitative year long relationships with 21 clinicians. The three theoretical functions are expressed through the application of a selection of complementary knowledge brokering activities.[22] In addition, the facilitation and evaluation functions of knowledge brokers were also evident in this study. Research fellows described evaluating clinicians' capability and motivation to do research, and their workplace demands, in order to facilitate their learning about and engagement with research.[23]

The relational functions of initiating, facilitating and evaluating interpersonal contact are core to knowledge brokering.[23 24] This study contributes a unique explanation of how research fellows (as embedded researchers) used knowledge brokering activities to create individualised learning-focused relationships.[25] Research fellows have used facilitation and the timely provision of research education to build clinicians' capacity to undertake research.[20 35] Their additional contextual knowledge of the healthcare organisation enabled research fellows to choose appropriate knowledge brokering activities.[23 24] They enacted a broader range of activities than the more traditional capacity building activities of training, mentoring, leadership and networking.[36 37] Research fellows described initiating, modelling and facilitating linkage and exchange activities with key stakeholders.[36] They brokered knowledge networks and created practical just-in-time learning tools to support local research projects.[9 24] They helped to clarify the research process in the local context, making it clinically relevant and personally meaningful.[5]

This study describes an overarching learning process in which embedded research fellows selected knowledge brokering activities to create individualised, practical research curriculums, to facilitate clinicians' engagement in research. They aligned clinicians' willingness to learn with specific research tasks.[5 7 28] Further, they recognised that when this learning was individualised and contextualised in a local research project, it was more meaningful.[38] It is also consistent with other studies that have shown that when individuals view research as important to being a professional, it may facilitate their involvement in local projects, which then enhances their skills and confidence.[38 39]

As they were embedded in the healthcare organisation, research fellows were aware of the organisational demands and supports for research (or lack thereof) and

they were able to support individuals' learning needs.[5] They aligned clinicians' research capabilities and motivation around local research projects.[30 37] They actively facilitated clinicians' confidence in and sense of control of their research journey.[7 8] Research fellows also initiated many linkage and knowledge management activities when clinicians were unfamiliar or underconfident. They monitored individuals' emotional responses, set clear expectations and sequenced appropriate tasks amidst their clinical work pressures.[40] They used existing social networks to reinforce personal and practical learning.[28 37] This reflexive process suggests that knowledge brokering activities may be important mechanisms to support research learning opportunities and progressively build clinicians engagement in research.[22]

Practical implications

Health and academic leaders could consider structuring embedded researcher positions to include knowledge brokering roles and activities, specifically for research interested clinicians who are ready to participate in and lead research projects.

Initial identification of clinicians' motivation and capability for engaging in research, together with matching the demands of the work environment with the tasks of local research project can set the scene. Embedded researchers may need to initiate linkage and exchange activities to identify, communicate and collaborate with a local network of researchers around each clinician. They may also need to create research projects using local project management tools and strategies. With facilitative relationships that support clinicians' learning about research, embedded researchers can gradually hand over specific research tasks, support just-in-time learning and provide ongoing feedback.

Limitations and strengths

A strength of this study is that research fellows were reflexively and creatively engaged in making sense of their own use of knowledge brokering activities when working with clinicians.

A key limitation of this study is the focus on allied health clinicians within one health service at a point in time when there was management support for professorial and senior research fellow positions. This study focused on the individual relationships between embedded researchers and clinicians without detailed consideration of organisational strategies that can also facilitate clinicians' motivation and maximise social influences.[7]

Future research is required to monitor the continuation and scale up of these interventions, and to monitor patient outcomes as clinicians improve their research engagement.

CONCLUSIONS

This study has extended the application of knowledge brokering activities in clinical practice beyond research capacity building to include knowledge management and linkage and exchange activities. Different knowledge brokering activities have been used together within an individualised research journey for research interested clinicians to participate in and lead research projects in their workplace. Experienced research fellows described evaluating clinicians' motivation and research capabilities and matching tasks in their local work context to complete a specific research project. Research fellows initiated linkage and exchange activities to build networks and establish research projects while facilitating knowledge management, within capacity building roles. They described cocreating a learning journey for each clinician, their research project and in their workplace.

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REFERENCES

1 Harding K, Lynch L, Porter J, *et al*. Organisational benefits of a strong research culture in a health service: a systematic review. *Aust Health Rev* 2017;41:45–53.
2 Jonker L, Fisher SJ, Dagnan D. Patients admitted to more research-active hospitals have more confidence in staff and are better informed about their condition and medication: results from a retrospective cross-sectional study. *J Eval Clin Pract* 2020;26:203–8.
3 Boaz A, Hanney S, Jones T, *et al*. Does the engagement of clinicians and organisations in research improve healthcare performance: a three-stage review. *BMJ Open* 2015;5:e009415.
4 Zych MM, Berta WB, Gagliardi AR. Conceptualising the initiation of researcher and research user partnerships: a meta-narrative review. *Health Res Policy Syst* 2020;18:24.
5 Williams J, Craig TJ, Robson D. Barriers and facilitators of clinician and researcher collaborations: a qualitative study. *BMC Health Serv Res* 2020;20:1126.
6 Borkowski D, McKinstry C, Cotchett M, *et al*. Research culture in allied health: a systematic review. *Aust J Prim Health* 2016;22:294–303.

7 Wenke R, Noble C, Weir KA, *et al*. What influences allied health clinician participation in research in the public hospital setting: a qualitative theory-informed approach. *BMJ Open* 2020;10:e036183.

8 Cianciolo AT, Mitzelfelt J, Ghareeb A, *et al*. Physician-scientist or basic scientist? exploring the nature of clinicians' research engagement. *Adv Health Sci Educ Theory Pract* 2021;26:353–67.

9 Cheetham M, Wiseman A, Khazaeli B, *et al*. Embedded research: a promising way to create evidence-informed impact in public health? *J Public Health* 2018;40:i64–70.

10 Matus J, Walker A, Mickan S. Research capacity building frameworks for allied health professionals - a systematic review. *BMC Health Serv Res* 2018;18:716.

11 Wenke R, Mickan S. The role and impact of research positions within health care settings in allied health: a systematic review. *BMC Health Serv Res* 2016;16:355.

12 Braithwaite J, Churruca K, Long JC, *et al*. When complexity science meets implementation science: a theoretical and empirical analysis of systems change. *BMC Med* 2018;16:63.

13 Holmes BJ*et al*. Mobilising knowledge in complex health systems: a call to action. *Evidence & Policy* 2017.

14 Wenke RJ, Ward EC, Hickman I, *et al*. Allied health research positions: a qualitative evaluation of their impact. *Health Res Policy Syst* 2017;15:6.

15 Harvey D, Plummer D, Nielsen I, *et al*. Becoming a clinician researcher in allied health. *Aust Health Rev* 2016;40:562–9.

16 Pain T, Petersen M, Fernando M. Building allied health research capacity at a regional Australian Hospital: a follow-up study. *Internet J Allied Health Sci Pract* 2018;16:8.

17 Williams C, Miyazaki K, Borkowski D, *et al*. Research capacity and culture of the Victorian public health allied health workforce is influenced by key research support staff and location. *Aust Health Rev* 2015;39:303–11.

18 Wolfenden L, Yoong SL, Williams CM, *et al*. Embedding researchers in health service organizations improves research translation and health service performance: the Australian Hunter new England population health example. *J Clin Epidemiol* 2017;85:3–11.

19 Vindrola-Padros C*et al*. The role of embedded research in quality improvement: a narrative review. *BMJ Quality & Safety* 2017;26:70–80.

20 Coates D, Mickan S. Challenges and enablers of the embedded researcher model. *J Health Organ Manag* 2020;34:743–64.

21 Hering JG. Do we need "more research" or better implementation through knowledge brokering? *Sustain Sci* 2016;11:363–9.

22 Bornbaum CC, Kornas K, Peirson L, *et al*. Exploring the function and effectiveness of knowledge brokers as facilitators of knowledge translation in health-related settings: a systematic review and thematic analysis. *Implement Sci* 2015;10:162.

23 Glegg SM, Hoens A. Role domains of knowledge brokering: a model for the health care setting. *J Neurol Phys Ther* 2016;40:115–23.

24 Dobbins M, Robeson P, Ciliska D, *et al*. A description of a knowledge broker role implemented as part of a randomized controlled trial evaluating three knowledge translation strategies. *Implement Sci* 2009;4:23.

25 Ward V, House A, Hamer S. Knowledge brokering: the missing link in the evidence to action chain? *Evid Policy* 2009;5:267–79.

26 Ward VL, House AO, Hamer S. Knowledge brokering: exploring the process of transferring knowledge into action. *BMC Health Serv Res* 2009;9:12.

27 Rivard LM, Russell DJ, Roxborough L, *et al*. Promoting the use of measurement tools in practice: a mixed-methods study of the activities and experiences of physical therapist knowledge brokers. *Phys Ther* 2010;90:1580–90.

28 Hitch D, Rowan S, Nicola-Richmond K. A case study of knowledge brokerage in occupational therapy. *Int J Ther Rehabil* 2014;21:389–96.

29 Russell DJ, Rivard LM, Walter SD, *et al*. Using knowledge brokers to facilitate the uptake of pediatric measurement tools into clinical practice: a before-after intervention study. *Implement Sci* 2010;5:92.

30 Mickan S, Wenke R, Weir K, *et al*. Strategies for research engagement of clinicians in allied health (stretch): a mixed methods research protocol. *BMJ Open* 2017;7:e014876.

31 Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies: guided by information power. *Qual Health Res* 2016;26:1753–60.

32 Carter SM, Little M, Knowledge J. Methodologies, and methods in qualitative research. *Qualitative Health Research* 2007;17:1316–28.

33 Braun V, Clarke V. What can "thematic analysis" offer health and wellbeing researchers? *Int J Qual Stud Health Well-being* 2014;9:26152.

34 Braun V, Clarke V. One size fits all? what counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology* 2020:1–25.

35 Mickan S, Coates D. Embedded researchers' purpose and practice: current perspectives from Australia. *Int J Health Plann Manage* 2022;37:133–42. **n/a**(n/a.

36 Cooke J, Gardois P, Booth A. Uncovering the mechanisms of research capacity development in health and social care: a realist synthesis. *Health Res Policy Syst* 2018;16:93.

37 Gee M, Cooke J. How do NHS organisations plan research capacity development? strategies, strengths, and opportunities for improvement. *BMC Health Serv Res* 2018;18:198.

38 Alison JA, Zafiropoulos B, Heard R. Key factors influencing allied health research capacity in a large Australian metropolitan health district. *J Multidiscip Healthc* 2017;10:277–91.

39 McCurtin A, O'Connor A, Irish Association of Speech and Language Therapists Research Special Interest Group. Building a collaborative research community of practice and supporting research engagement in speech-language pathology: identification of stakeholder priorities. *JBI Evid Implement* 2020;18:368-375.

40 Noble C, Billett SR, Phang DTY, *et al*. Supporting resident research learning in the workplace: a rapid realist review. *Acad Med* 2018;93:1732–40.