Examining knowledge translation practices by researchers and research engagement by end-users working in transfusion medicine

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Statement of originality

This is to certify that the content of this thesis is my own work. This thesis has not been submitted for any other degree or purpose.

I certify that the intellectual content of this thesis is the product of my own work, and that all assistance received in preparing this thesis and all sources have been acknowledged.

Amanda Navan

30 September 2025

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Chapter 2 of this thesis has been published as *Thijsen A, Masser B, Davison TE, Kruse SP, Williamson A. Examining knowledge translation in blood donor research: A review of vasovagal reaction literature. Transfusion. 2021; 61(6):1772–1779. https://doi.org/10.1111/trf.16391*. I designed the study, conducted the literature searches, screening and data extraction, and drafted the manuscript.

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In addition to the authorship attribution statements above, in cases where I am not the corresponding author of a published item, permission to include the published material has been granted by the corresponding author.

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No content produced by generative AI tools has been used in the preparation of this thesis.

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Abstract

Background: Research is key to advance knowledge and address individual, organisational and societal issues. Transferring this knowledge into practice, however, is a known slow and difficult process. It relies on relevant, reliable and accessible research knowledge, researcher actions to share their knowledge and engage end-users, end-user actions to engage with and use research knowledge, and the organisational context to facilitate research knowledge use. Whilst the process of knowledge translation (KT) has been studied in various fields, no studies have explored this process in transfusion medicine. The overall aim of this thesis was to examine how knowledge from research is shared, engaged with, and used in policy and practice in the area of transfusion medicine.

Methods: Three studies were conducted. In Study 1, I performed a rapid review of blood donation literature to examine the research evidence (i.e. knowledge) potentially available to be implemented into practice (*Chapter 2*). Specifically, in this study I applied the Knowledge-to-Action framework to map articles focusing on vasovagal reactions in blood donation along the research-to-practice trajectory. In Study 2, I conducted an international survey study to examine the barriers, facilitators, and potential supports needed to practice KT among researchers working in transfusion medicine (*Chapter 3*). Further, in this survey study I also examined researchers' views and practices of KT (*Chapter 4*). In Study 3, I interviewed potential knowledge end-users working in a single department within a blood collection agency to describe their experiences of engaging with and using research, and to identify opportunities to strengthen KT (*Chapter 5*).

Results: In Study 1, I found that 84% of articles focusing on vasovagal reactions were published in the last two decades. Most of the articles were observational studies (n = 117; 66%), with fewer intervention studies (n = 31; 18%), reviews (n = 20; 11%), and implementation and evaluation studies (n = 5; 3%) found. Further, 14 strategies to reduce vasovagal reactions were identified in 31 studies, suggesting that research evidence available for translation may be limited

In Study 2, a survey study with researchers, I determined that competing priorities (Med: 4 [IQR: 3-4]), time constraints (Med: 4 [IQR: 3-4]), and lack of funds or resources (Med: 4 [IQR: 3-4]) were the most frequently reported barriers to KT. Maintaining good relationships with end-users was the highest reported facilitator (78%), however, a number of researchers indicated that they did not know how to contact end-users (23%) or felt that end-users did not understand their research (23%). To support their KT efforts, researchers wanted more collaboration opportunities through facilitated networks (69%), protected time for KT (65%), and access to KT resources (58%). Further, most researchers indicated that KT was important (86%) and felt responsible for facilitating KT of their work (69%). Less than half of respondents, however, felt they had the skills to facilitate KT or knew which strategies to use (both 45%). Respondents primarily reported using diffusion activities to share their research (86%), such as publishing in peer-reviewed journals (74%) and presenting at academic conferences (72%). Many respondents reported having engaged end-users to some extent in their research (72%). Differences in dissemination strategies and level of end-user engagement were found by career stage, work setting, and KT training.

In Study 3, an interview study with research end-users at one blood collection agency in Australia, I determined that the individual capacity of end-users to engage with and use research was affected by their role, training, and prior work experience. Research knowledge was mostly used by senior managers to support policy and practice changes, understand blood collection issues, and inform policy development. Participants of all levels, however, described a lack of visibility of this research use for frontline staff. Further, the role of research within the organisation and systems to access research were not viewed as clear or available.

Conclusion: This is the first program of work to explore, in-depth, the extent of KT in transfusion medicine. In this thesis I found that transfusion medicine is still in the early stages of KT, but researchers are interested in translating their work and end-users value research. Strengthening the available research knowledge, improving the capacity and capabilities of researchers and end-users to practice

KT, as well as enhancing organisational structures, systems and visibility of research use can further advance KT in transfusion medicine.

Table of contents

Dissemination of research

Parts of the work presented in this thesis have been published and/or presented in the following journals and conferences:

Peer-reviewed papers

1. **Thijsen A**, Masser B, Davison TE, Kruse SP, Williamson A. Examining knowledge translation in blood donor research: A review of vasovagal reaction literature. *Transfusion*. 2021; 61:1772–1779. https://doi.org/10.1111/trf.16391
2. **Thijsen A**, Williamson A, Davison TE, Masser B. Experiences of knowledge translation among researchers in transfusion medicine: findings from an international survey study. Transfusion. 2023; 63(8): 1463-1471. https://doi.org/10.1111/trf.17466
3. **Thijsen A**, Masser B, Davison TE, Williamson A. Researchers' views on and practices of knowledge translation: an international survey of transfusion medicine researchers. Implementation Science Communications. 2024; 5(1): 9. https://doi.org/10.1186/s43058-024-00546-3
4. **Thijsen A**, Masser B, Davison TE, Edwards AR-A, Moore G, Williamson A. The use of research evidence in blood collection policy and practice: a qualitative study with front-line staff, middle managers, and senior managers. Health Research Policy and Systems. In press.

Conference presentations

1. **Thijsen A**, Masser B, Davison TE, Kruse SP, Williamson A. Examining knowledge translation in blood donor research: a review of vasovagal reaction literature. *4th European Conference on Donor Health & Management*. Hamburg, Germany (virtual). September 15-17, 2021.

2. **Thijsen A**, Williamson A, Masser B, Davison TE. Examining knowledge translation practice among researchers working in transfusion medicine: a cross-sectional, international survey study. *NHMRC Research Translation Long Weekend 2022*. Sydney, Australia (hybrid). November 17-22, 2022.

Seminars

1. **Thijsen A**. Examining knowledge translation from research to blood transfusion policy. *Australian Red Cross Lifeblood Student Research Symposium 2025*. Sydney, Australia (virtual). June 19, 2025. Presented PhD findings back to end-users.

Chapter 1: Introduction

Transfusion medicine is a multidisciplinary field – combining basic and applied science research – focused on the collection, processing, storage, and use of blood and blood-related products. The aim of most of the research in this area is to advance knowledge and address problems faced by blood collection agencies (Devine et al., 2007; Devine et al., 2010). The volume of research in transfusion medicine has grown exponentially in the last decades (Thijsen, Masser, et al., 2021; Thorpe et al., 2024; Van Remoortel et al., 2024; White et al., 2025). For example, a 2013 systematic review of the published literature on risk factors for low haemoglobin in blood donors included 40 studies from 1982 to 2012 (Smith et al., 2013). An increase in the volume of research prompted the authors to conduct an updated systematic review less than ten years later, with an additional 76 new studies identified from 2012 to 2019 (Browne et al., 2020). Further, transfusion medicine has seen a rise in conferences, with the recent addition of new conferences such as the European Conference on Donor Health and Management in 2014 (Ramond & Di Angelantonio, 2015) and BloodHIT in 2022 (Irish Blood Transfusion Service, 2022). Taken together, these show a trend of an increase in new knowledge generated from research in transfusion medicine.

Experience from other disciplines suggests, however, that transferring this wealth of new research knowledge into transfusion policy and practice may be a slow and difficult process (Colditz & Emmons, 2018; Grimshaw et al., 2012). Indeed, in the broader literature, studies have shown that less than half of innovations are ever used in practice and even those that are take almost two decades to be implemented (Balas & Boren, 2000; Grant et al., 2003; Morris et al., 2011). In transfusion medicine, this problem has been exemplified in research relating to vasovagal reactions – where donors experience feeling lightheaded, dizzy or nauseous, or lose consciousness due to a drop in arterial blood pressure and cerebral perfusion (Thijsen & Masser, 2019). As one of the most frequently reported adverse events and one of the major deterrents to continued blood donation, vasovagal reactions have received significant attention in research (Donald et al., 2019; Fisher et al., 2016; Thijsen & Masser, 2019;

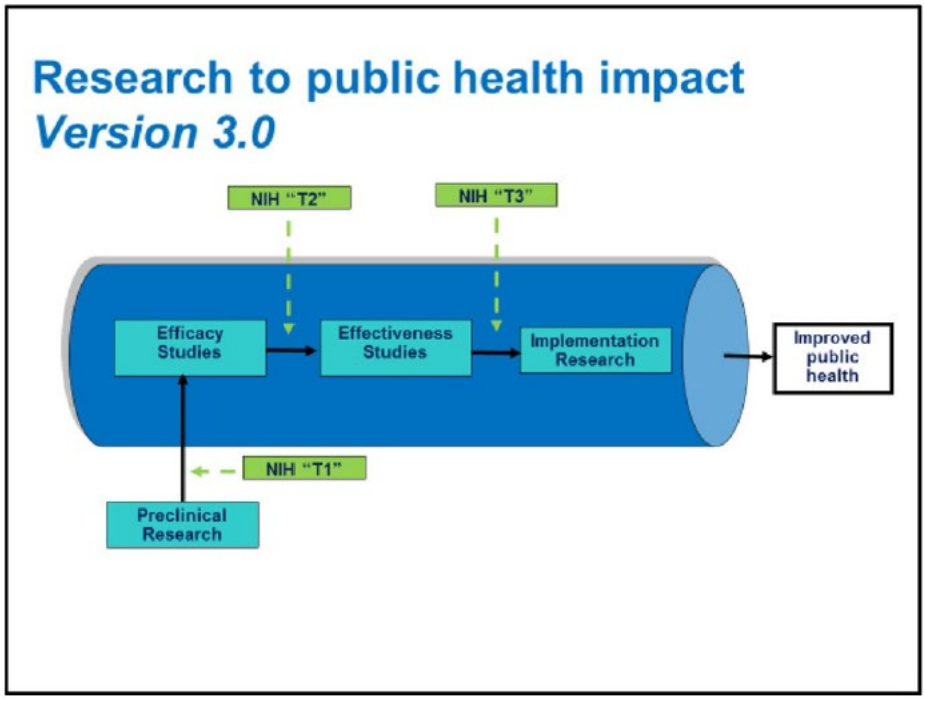
Thijsen, Masser, et al., 2021; Van Remoortel et al., 2024; Wang et al., 2022; Wu et al., 2025). Studies have demonstrated that pre-blood donation water loading and applied muscle tensing exercises during the donation significantly reduce donor risk of a vasovagal reaction (Fisher et al., 2016; Van Remoortel et al., 2024; Wang et al., 2022). Australian Red Cross Lifeblood subsequently implemented new donor educational materials and frontline staff training in 2018 to encourage the use of these two strategies (Thijsen et al., 2020). In an internal study by Australian Red Cross Lifeblood (Thijsen et al., 2018, October 15), however, only 38% of surveyed donors reported using applied muscle tension and 75% reported using water loading at their last donation. Further, a large proportion of surveyed donors were not aware of the two strategies. Similar experiences of difficulties translating these strategies into routine blood collection practice have been reported in Canada, with 82% of surveyed donors using water loading and 41% performing applied muscle tension (Goldman et al., 2021). Consequently, donors are unnecessarily exposed to a higher risk of experiencing a vasovagal reaction, potentially negatively affecting their well-being through an increased risk of injury, as well as negatively affecting their ability and/or motivation to continue to donate blood (Newman & Siegfried, 2012; Thijsen et al., 2019). The evident challenges involved in getting even low cost, highly transportable evidence-based practice change routinely taken up in the blood donation space illustrates the importance of understanding how knowledge from research is translated to transfusion medicine practice. Information is required to inform strategies to narrow the gap between what is known in research and what is being done in practice.

1.1 Knowledge translation

It was previously believed that providing evidence of the efficacy of an intervention was sufficient to result in policy and practice impact (Bauer & Kirchner, 2020). This changed in the late 1990s with the rise of effectiveness studies, which expanded the focus of clinical research from assessing the efficacy of an intervention in a controlled setting to measuring the effectiveness of an intervention in real-world environments (Bauer & Kirchner, 2020; Curran et al., 2012). This shift was driven by observed discrepancies between how interventions performed under highly controlled experimental conditions

and their outcomes in routine clinical practice (Bauer et al., 2001). It soon became apparent, however, that demonstrating effectiveness did not guarantee uptake of an innovation outside of the research context (Bauer & Kirchner, 2020; Dearing et al., 2018; Green et al., 2009). In recognition of this, a new field of research was established, focused on reducing the research-to-practice gap and speeding up the time taken for research innovations to become part of routine practice (Bauer & Kirchner, 2020; Eccles & Mittman, 2006; Graham et al., 2006; Westerlund et al., 2019). This new field of research sits at the end of the research pipeline, following efficacy and effectiveness research (see Figure 1).

Figure 1 The research pipeline



Note: "Implementation Research" is another term used to describe knowledge translation; Source: Bauer and Kirchner (2020)

Many terms have been used to describe this field or certain aspects of it, including knowledge translation, research utilisation, knowledge mobilisation, dissemination, and implementation (Graham et al., 2006). In this thesis, I will use the term "knowledge translation" (KT) which is defined as the synthesis, dissemination, exchange, and application of knowledge to improve health, health services and products, and the health care system (Canadian Institutes of Health Research, 2016, July 28; Graham et al., 2006). Central to KT are four domains. In the first, *synthesis*, research knowledge from

multiple studies on a single topic is collated. *Dissemination* refers to sharing research knowledge through tailored communications to a specific audience. *Exchange* relates to the interactions between researchers and knowledge end-users to facilitate mutual learning. Finally, *application* refers to the activities focused on putting the research findings into practice (Graham et al., 2006; Straus et al., 2013). The range of activities within each KT domain is determined by what knowledge is being translated, the purpose of the translation, and who is meant to change their behaviour (Rushmer et al., 2019).

KT differs from "implementation science" and "dissemination science", with the former focusing on studying the methods that promote the adoption and integration of research evidence into practice (Eccles & Mittman, 2006; Glasgow et al., 2012; Wensing & Grol, 2019). On the other hand, "dissemination science" examines how to effectively communicate research evidence and materials to stakeholders with the aim of spreading knowledge and promoting uptake (Dearing et al., 2018; Glasgow et al., 2012). KT is a broader concept that includes how studies are designed and conducted as well as how the findings are disseminated and implemented (Wensing & Grol, 2019). In addition, it looks at how potential knowledge end-users are aware of and engage with research evidence and the extent of their involvement in the research process (Abu-Odah et al., 2022).

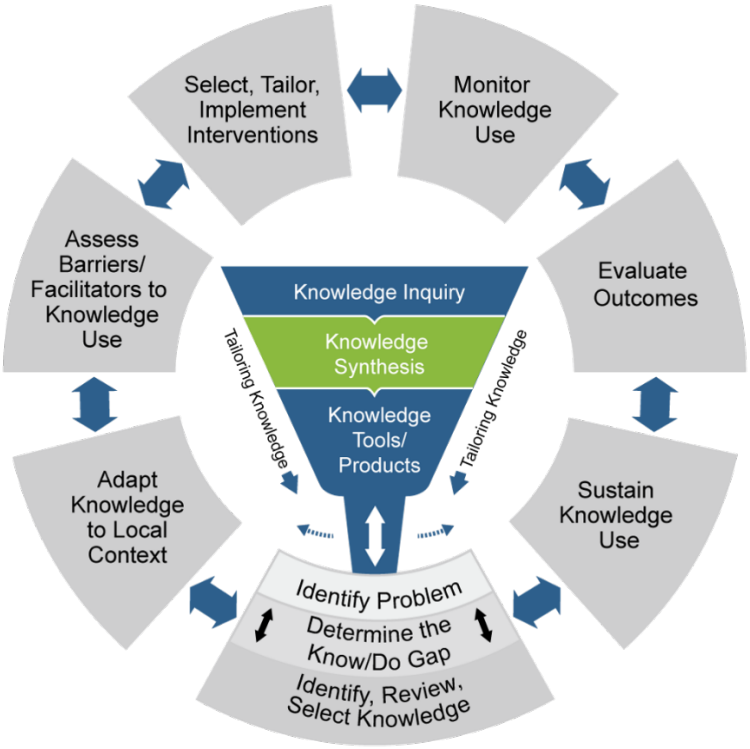
The process from knowledge to practice, however, is not linear (Glasgow et al., 2012; Straus et al., 2013). It is the result of the complex interplay between new research knowledge, the knowledge, attitudes, skills and behaviours of research-producers and knowledge end-users, and the context in which the research knowledge is going to be applied (Glasgow et al., 2012; Kristensen et al., 2016). Each of these key elements is described in more detail below.

1.2 Research knowledge

A multitude of theories, models and frameworks have been developed to further our understanding of and support KT efforts (Damschroder, 2020; Lynch et al., 2018; Nilsen, 2015). In most of these theoretical approaches, knowledge sits at the centre or forms the starting point of the KT process. For

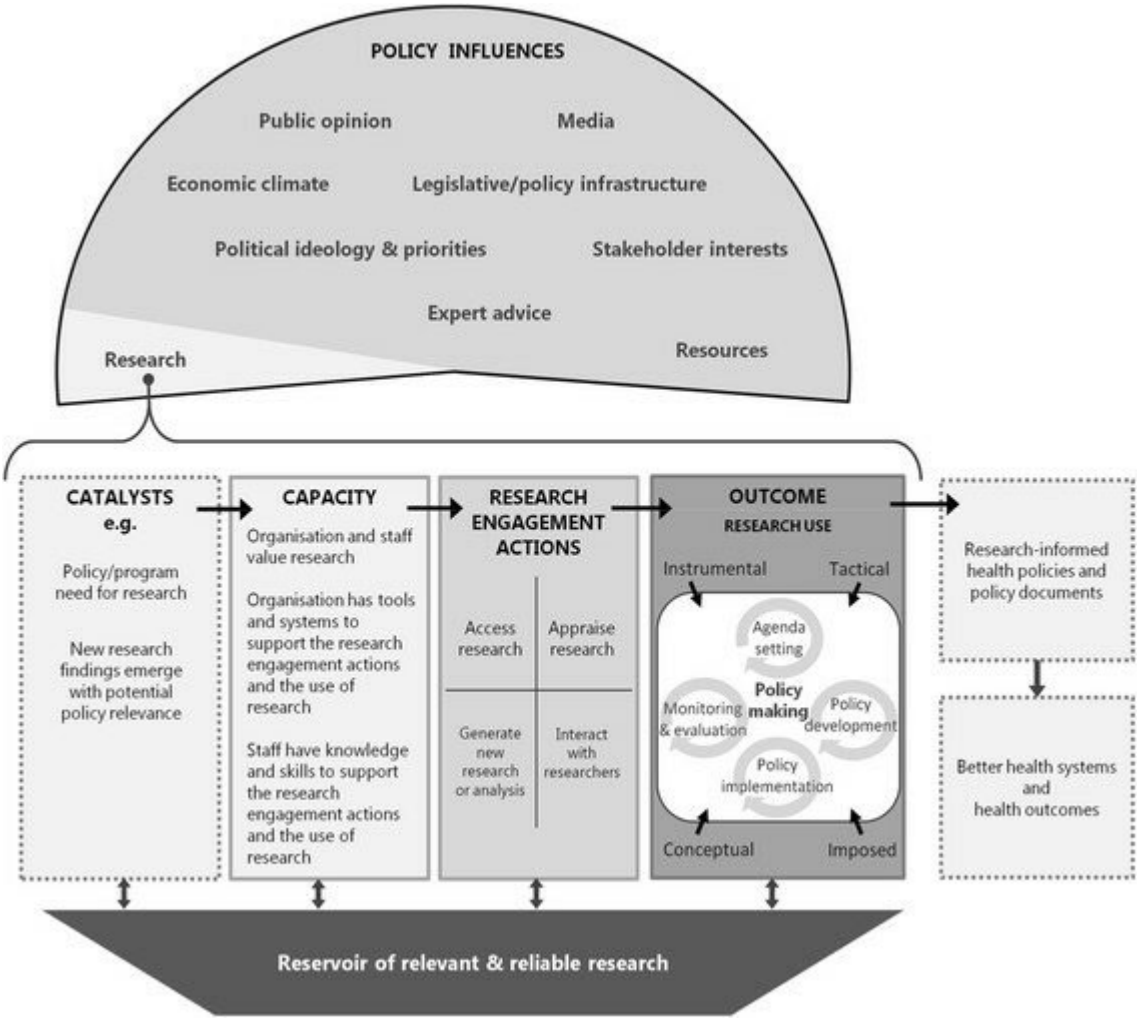
example, knowledge creation sits in the centre of the Knowledge to Action framework (see Figure 2a) and a reservoir of relevant and reliable research sits at the base of the SPIRIT Action Framework (see Figure 2b). While I acknowledge that there are other types of knowledge, in this thesis I focus on knowledge generated from research (i.e., research evidence).

Figure 2a The Knowledge to Action framework



Source: Straus et al. (2013)

Figure 2b The SPIRIT Action Framework.



Source: Redman et al. (2015)

Characteristics of the available research knowledge influences the likelihood of uptake in practice (Grol & Grimshaw, 2003). For knowledge to be used, it needs to be perceived as relevant in terms of its timeliness, salience, and actionability (Contandriopoulos et al., 2010; Innvær et al., 2002; Kristensen et al., 2016; Redman et al., 2015). Knowledge that includes a concrete description of the desired actions, is not complex, and is compatible with existing values is more likely to be adopted (Grol & Grimshaw, 2003). Further, the relative advantage of the new knowledge compared to the current practice needs to be seen to encourage its uptake in practice (Harvey & Kitson, 2016).

Ideally, knowledge also needs to be shown to be reliable through the conduct and synthesis of multiple high-quality studies, rather than single studies, to increase the likelihood of uptake (Grimshaw et al., 2012; Grol & Grimshaw, 2003; Harvey & Kitson, 2016; Oliver et al., 2014). Individual studies, in isolation, seldom provide sufficiently robust evidence to change policy or practice as they may be biased in their conduct or there are random variations in their results (Grimshaw et al., 2012). Multiple studies are therefore needed to determine the effect of the new research knowledge before its translation into policy or practice. It is important to acknowledge, however, that in reality policy and practice have been changed on the basis of a single study – with varying degrees of robustness. This demonstrates that the quality of available evidence alone does not drive change (Bauer & Kirchner, 2020; Niven et al., 2015; Prasad et al., 2011).

Finally, knowledge needs to be accessible with regard to availability, formatting, and understandability (Contandriopoulos et al., 2010; Oliver et al., 2014). Tailored dissemination of knowledge, such as small interactive meetings and plain language summaries, have been shown to be more effective in promoting knowledge uptake than broader diffusion strategies such as publishing in peer reviewed journals or presenting at academic conferences (Chapman et al., 2021; Lomas, 1993; Wilson et al., 2010). Furthermore, knowledge that is accessible through a set research infrastructure (e.g., easy to use libraries, databases) or through interactions with researchers had an increased likelihood of being used in policy (Edwards et al., 2019; Innvær et al., 2002; Williamson et al., 2019).

Whilst a crucial element, the existence of high-quality knowledge alone does not ensure its use. Knowledge use is reliant on the actions and perceptions of knowledge producers and users, their relationship, as well as the context in which they work (Contandriopoulos et al., 2010; Harvey & Kitson, 2016; Mitton et al., 2007; Nilsen & Bernhardsson, 2019; Redman et al., 2015).

1.3 Knowledge producers

Researchers are generally seen as knowledge producers. They are an integral part of KT from generating knowledge to sharing and encouraging the use of research evidence (Murunga et al., 2020; Oliver et al., 2014; Rushmer et al., 2019).

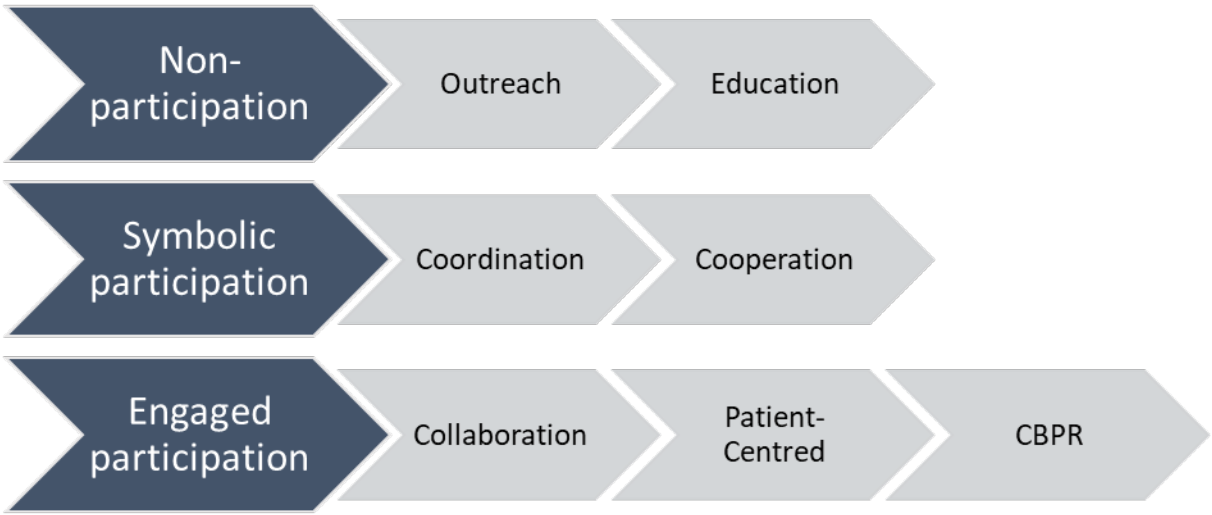
Researchers can facilitate KT by aligning their research to the needs of knowledge end-users, including policymakers and practitioners, through end-user engagement (Bombard et al., 2018; Goodman & Sanders Thompson, 2017; Grimshaw et al., 2012; Wolfenden et al., 2015). End-user or stakeholder engagement involves the two-way sharing of knowledge and experiences, where the researcher provides information about the research or innovation and the end-user provides information about the fit, feasibility, and appropriateness of the research for the setting (Pellecchia et al., 2022). Engaging end-users can take various forms but it generally falls within three broad categories (see Figure 3 below).

The first, *non-participation*, relates to efforts to inform end-users about the research that are typically associated with traditional dissemination activities including one-way sharing of information (i.e. outreach) and targeted activities to educate end-users about a particular topic or research (i.e. education) (Goodman & Sanders Thompson, 2017). Researchers can opt to share their research via passive and untargeted methods, including journal articles, mass mailings, and conference presentations, or via more active and tailored methods, including small group discussions and plain language summaries (Graham et al., 2013; Lomas, 1993). There is, however, evidence that knowledge shared through tailored dissemination methods and early engagement of partners who will share and provide access to the knowledge to potential end-users increases the likelihood of KT (Dearing & Kreuter, 2010).

The second, *symbolic participation*, involves activities where end-users advise on certain or all aspects of the research, but researchers remain in control of decision-making. It includes coordination efforts, where end-users provide feedback on elements of the research, and cooperation efforts, where end-users provide help with a project.

In the last category, *engaged participation*, end-users have shared decision-making authority and collaboratively manage the research. It includes collaboration efforts, where end-users are actively involved in the design and execution of the research as well as interpretation of the findings, as well as patient-centred and community-based participatory research, where end-users determine research priorities, control the design and execution of the research, and interpret and share findings, with researchers facilitating their efforts (Goodman & Sanders Thompson, 2017; Pellecchia et al., 2022). This final category ensures that the research meets the needs of the end-users and relies on mutual trust, acknowledgement of each other's expertise, and shared decision-making (Pellecchia et al., 2022).

Figure 3 Categories and classifications of stakeholder engagement.



CBPR = Community-based participatory research; Source: Goodman and Sanders Thompson (2017)

There is evidence that greater end-user engagement by researchers can both improve the relevance and methodology of the research as well as the uptake of research in policy and practice (Boaz et al., 2015; Bombard et al., 2018; Sprague Martinez et al., 2018). Involving end-users in the research process, such as setting priorities, undertaking research activities or sharing research evidence, increases the alignment of the newly generated research knowledge with the priorities or needs of end-users (Boaz et

al., 2015; Bombard et al., 2018). Consequently, research knowledge is more likely to be used in policy or practice (Boaz et al., 2015; Crockett et al., 2019; Wolfenden et al., 2015).

While researchers have an important role to play in closing the KT gap, they may face several challenges in achieving this. For example, researchers may struggle to modify the research cycle to fit real-world timelines, find it difficult to allocate time and other resources to development of relationships with end-users, and experience a lack of prioritisation or recognition of KT activities by their academic institutions or organisations (Mitton et al., 2007; Sibley et al., 2017). Further, insufficient resources, funds or time dedicated to KT activities are barriers to KT frequently mentioned by researchers (Sibley et al., 2017). In addition, researchers may feel they are not sufficiently skilled or do not have the ability to practice KT (Sibley et al., 2017). Experienced researchers have reported feeling frustrated, disappointed and burned out in relation to their attempts to translate their research findings, which may affect their motivation to practise KT (Sibley et al., 2017). On the other hand, strong relationships and trust between researchers and end-users, mentorship and training in KT, having adequate funding and resources, and having access to communication specialists have been identified as facilitators to researchers' KT activities (Campbell et al., 2009; Innvær et al., 2002; Mitton et al., 2007; Murunga et al., 2020; Sibley et al., 2017). Researcher knowledge of policy processes and aligning research to policy focus areas has also been noted as conducive to research use (Campbell et al., 2009; Oliver et al., 2014). Gaining an understanding of how researchers facilitate KT and what barriers and facilitators they face when (attempting to) practising KT is an important step towards closing the KT gap.

1.4 Knowledge end-users

The second key group in the KT process are knowledge end-users, who use research evidence to inform policy and practice. The term 'end-users' refers to a broad range of people including frontline clinical staff, middle managers, senior managers, and policy-makers (Jull et al., 2019; Lavis et al., 2006). Although research may be used by other groups, such as the general public, I narrowed the focus in this thesis to those working within an organisation.

Policy-makers can use research to either directly inform priority setting or decisions making to address identified issues, clarify their understanding or change their thinking about an issue, or justify and/or persuade others to support a predetermined decision (Makkar et al., 2016; Redman et al., 2015). In addition, policy-makers may use research due to legislative, funding, or organisational requirements. In order to engage with research, end-users need to access and appraise research evidence, create new research or analysis, and/or interact with researchers. These are reliant on the end-user's attitudes, knowledge and skills as well as availability of organisational tools and systems, allocated time, funding and resources (Loncarevic et al., 2021; Makkar et al., 2016; Redman et al., 2015).

Middle managers, that is people who manage frontline staff but are supervised by senior managers, can also play a critical role in facilitating KT (Birken et al., 2018; Birken et al., 2015; Birken et al., 2012; Boutcher et al., 2022). First, middle managers can share information about the research or innovation with their teams but also provide information about uptake of research and current practice to senior managers and researchers. Second, they can synthesise information by collecting, merging, interpreting and explaining research- or practice-related information. Third, middle managers mediate between strategy and day-to-day activities such as addressing issues faced by their frontline team and supporting their teams to engage with and implement research knowledge. Finally, middle managers can facilitate KT by promoting the research by showing positive attitudes towards the research, establishing norms, and becoming knowledgeable opinion leaders. The extent to which middle managers effectively perform these roles relies on their knowledge and beliefs about the research as well as their skills and beliefs about their (own) capabilities and capacity to engage with research (Birken et al., 2018; Hartviksen et al., 2019). Importantly, due to their credibility and extensive knowledge of the local context, middle managers can have a strong influence the extent of KT (Boutcher et al., 2022).

Clinical frontline staff, such as nurses, rely on research to determine best practices which, in turn, ensures that patients receive optimal care and improved outcomes (Athanasakis, 2013; Moore & Tierney, 2019; Tuppal et al., 2019). Clinical frontline staff need to be aware of and understand the

research knowledge (Tuppal et al., 2019). Further, they need to be able to access, appraise and apply the research knowledge to practice (Moore & Tierney, 2019). Similarly to the other two end-user groups, the extent to which frontline staff engage with and use research relies on their knowledge, attitudes and skills (Moore & Tierney, 2019).

Despite the crucial role of end-users in facilitating KT, several end-user-related barriers and facilitators have been identified. At the individual level, limited involvement in the research process, time constraints, lack of skills to access and critically appraise research, lack of interest or perceiving low value in research, absence of relevant or appropriately presented research, limited internal research culture of sharing and discussing research knowledge, lack of awareness of research taking place, and difficulties applying the research evidence and recommendations to practice have been identified as barriers (Abu-Odah et al., 2022; Campbell et al., 2009; Edwards et al., 2019; Kristensen et al., 2016; Moore & Tierney, 2019; Oliver et al., 2014; Shayan et al., 2019). Further, frontline staff may encounter role-specific barriers such as research engagement not being seen as part of their role and limited authority to change practice (Moore & Tierney, 2019; Tuppal et al., 2019). On the other hand, factors that facilitate research engagement among end-users include easy access to research and researchers, strong collaborative relationships with researchers, tailored communications of research findings, end-users' motivation and interest in understanding and applying research evidence, early engagement of end-users in the research process, managerial support, good critical appraisal skills, and available technology to support research engagement (Abu-Odah et al., 2022; Armstrong et al., 2014; Campbell et al., 2009; Lawrence et al., 2019; Oliver et al., 2014; Redman et al., 2015). Gaining an understanding into these barriers and facilitators are key to overcome the research-to-practice gap.

1.5 Contextual factors

Whilst KT processes rely on the individual behaviours of researchers and end-users to some extent, they are also highly dependent on contextual factors. Within an organisation, no one has the power or capacity to translate research knowledge into practice on their own (Contandriopoulos et al., 2010;

Holmes et al., 2017). Internal processes such as sense making, coalition building, and rhetoric and persuasion are needed to facilitate KT (Contandriopoulos et al., 2010). In particular, individuals rely on leadership, systems, resources, and culture within an organisation to help facilitate KT (Kristensen et al., 2016; Oliver et al., 2014; Slade et al., 2018).

Leadership – both formal and informal – can influence the KT process by sharing a clear organisational vision, goals and values focused on research use, such as a mission statement promoting research-informed policy and practice or outlining research activities in strategic plans and annual reports (Holmes et al., 2017; Kristensen et al., 2016; Slade et al., 2018). Leadership can also facilitate the development of, and ensure compliance with, research-related policies and procedures, which outline research engagement requirements and detail research responsibilities in job descriptions (Slade et al., 2018).

In addition, the availability of systems or a technical infrastructure to support research use is essential, such as easily accessible and user-friendly resources, subscriptions to journals and scientific literature, access to (commissioned) literature reviews, licences to statistical and bibliographic software, and an intranet site with relevant research evidence (Ellen et al., 2013; Grimshaw et al., 2012; Slade et al., 2018). Furthermore, organisations can establish and build awareness of where, how and who can assist with locating, obtaining, appraising, generating, and applying research evidence (Ellen et al., 2013).

Organisations can further support KT by generating their own research through dedicated resources and funding. They can create dedicated research and KT functions, building research capacity among their employees through research training, allocating funds for research activities, and creating formal engagements and collaboration with researchers and research institutions (Ellen et al., 2013; Lawrence et al., 2019; Slade et al., 2018). Organisations can also facilitate access to, or mandate, research training, establishing an internal research ethics committee or providing easy access to a local research ethics committee, and promoting involvement in research networks and partnerships (Slade et al., 2018). On

the other hand, organisations can also provide resources and funding to enhance the skills and capabilities of their employees to locate and critically appraise research (Ellen et al., 2013).

Finally, organisations can instil a culture in which research is seen as important by sharing and discussing research. For example, organisations can provide (structured) opportunities to disseminate research such as through committees, communities of practice, journal clubs, seminars, and newsletters (Ellen et al., 2013; Lawrence et al., 2019; Slade et al., 2018). Further, organisations can incentivise research engagement, for example, by setting up a reward and recognition program to recognise staff who have engaged with or used research evidence (Ellen et al., 2013; Holmes et al., 2017; Slade et al., 2018).

Considering the complexities and influence of contextual factors, it is perhaps unsurprising that many of the barriers and facilitators reported by researchers and end-users relate to systemic or organisational factors such as time constraints and insufficient resources (Athanasakis, 2013; Edwards et al., 2019; Lawrence et al., 2019; Thijsen et al., 2023). Therefore, it is essential to consider the (local) context when trying to understand how knowledge from research is translated. It is important, however, to acknowledge that organisations themselves sit within a broader context and are often influenced by external factors such as political ideology and priorities, public opinions, regulatory frameworks, organisational networks, economic climate, media, and environmental factors (Harvey & Kitson, 2016; Nilsen & Bernhardsson, 2019; Redman et al., 2015).

1.6 Knowledge translation in transfusion medicine

In recognition of the importance of understanding how research is used in policy and practice, studies have investigated KT in a range of areas from stroke rehabilitation (Moore et al., 2018; Walker et al., 2013) to child welfare (Engell et al., 2018; Wulczyn et al., 2015). Research into KT in transfusion medicine, however, has been limited. Two editorials in different blood-related journals have highlighted the potential of using KT to progress the field of transfusion medicine: one outlining the significance

as well as potential challenges of translational research (Kleinman, 2009) and one recommending the use of multidisciplinary and evidence-informed approaches to bridge knowledge-practice gaps in transfusion medicine (Lorencatto et al., 2014). Further, a few methodological papers outlining approaches to KT have been published in transfusion-related journals in recent years, including a series of papers outlining the Knowledge-to-Action framework (Florez et al., 2018a, 2018b; Solh et al., 2018a; Solh et al., 2018b), a paper detailing Intervention Mapping (Thijsen, Waller, et al., 2021), and a paper outlining how to use implementation science principles, methods and frameworks to develop and ensure uptake of transfusion medicine guidelines (Crawshaw et al., 2025). In addition, there have been studies within transfusion medicine applying KT and implementation science methodology, such as a train-the-trainer course to increase uptake of transfusion medicine practice guidelines (Nizeyimana et al., 2024). However, to our knowledge, no studies have been conducted on understanding how knowledge from research is translated in the field of transfusion medicine. This is a critical step in order to identify opportunities to enhance KT in transfusion medicine and, ultimately, narrow the gap between knowledge and practice. Transfusion medicine differs from other health-related fields as it focuses on both the safe collection of blood and blood-related products from healthy volunteers – as opposed to patients requiring care – as well as the storage, processing and provision of blood and blood-related products to hospitals and healthcare organisations. Knowledge producers in transfusion medicine include social, clinical, data and basic science researchers, while potential knowledge end-users range from healthy volunteer blood donors, nurses and senior managers working in blood collection settings to clinicians, scientists and policy-makers ensuring the optimal storage and usage of blood. Given the significant effects of contextual factors, along with the unique characteristics and behaviours of both knowledge producers and end-users, it is essential to investigate KT specifically within transfusion medicine, rather than relying solely on insights from other health-related fields.

1.7 Thesis aims and objectives

As outlined above, KT is important to ensure that what we know to be best practice is implemented. This will lead to safer and more effective care, services, and products provided to blood donors and

recipients as well as to general healthcare. There are, however, numerous gaps in knowledge in relation to KT in transfusion medicine. First, the extent to which research knowledge is available to end-users to translate into transfusion-related policies and practice (i.e., research situated at the later stages of the research pipeline that is ready to be translated) is unclear. Having knowledge from research that is accessible, reliable, actionable, and relevant is central to KT. Second, there is limited insight into how transfusion medicine researchers practice KT and what barriers they face when (attempting to) translate their research. Gaining an understanding of their behaviours and experiences will allow for the identification of opportunities to support researchers in their KT efforts. Third, there is currently limited knowledge of how potential end-users engage with and use research evidence to support their policies and practices. Addressing this gap in knowledge is essential to identify areas to support end-users and facilitate the KT process.

To address these identified gaps in knowledge, the aims of this thesis are:

1) To explore where the published literature in transfusion medicine sits within the research-to-practice trajectory to determine the availability of research to be translated and assess its potential for translation into policy or practice (**Chapter 2**).
2) To examine transfusion medicine researchers' perceptions of barriers and facilitators to KT as well as what supports researchers believe would help facilitate KT (**Chapter 3**).
3) To examine transfusion medicine researchers' views on, and practices of, KT by specifically looking at how they disseminate their research and their end-user engagement throughout their research (**Chapter 4**).
4) To explore how research evidence is used and engaged with by end-users to inform blood collection policy and practice (**Chapter 5**).

1.8 Thesis structure

This thesis comprises three studies conducted to address the aims of this thesis.

Chapter 2 is a published rapid systematic review of the blood donation literature to explore where the published literature sits within the research-to-practice trajectory using the Knowledge-to-Action framework, addressing Aim 1. In the review, I focused on a key area of transfusion medicine research, vasovagal reactions during blood collection, which has great potential for knowledge translation.

Chapters 3 and 4 present an international survey study with a sample of researchers working in transfusion medicine. **Chapter 3** reports on the published survey findings on researchers' views on barriers and enablers to KT, and what supports they believe would enhance the translation of their research findings into policy and practice, addressing Aim 2. **Chapter 4** reports on the published survey findings on researchers' perspectives and practices related to KT, focusing specifically on how they share their research findings and engage with end-user throughout the research process, addressing Aim 3.

Chapter 5 describes an interview study with potential research end-users including frontline staff members, middle managers, or senior managers working in blood collection – a specific area of transfusion medicine. It explores how research evidence is used and engaged with by end-users to inform blood collection policy and practice using the SPIRIT Action Framework, addressing Aim 4. This paper has been accepted for publication.

Finally, **Chapter 6** summarises the key findings from the studies and outlines recommendations for future research and practical actions to strengthen KT in transfusion medicine.

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Chapter Two

Examining knowledge translation in blood donor research:
A review of vasovagal reaction literature

Preface

2.1 Chapter overview

This chapter consists of a published manuscript entitled "*Examining knowledge translation in blood donor research: A review of vasovagal reaction literature*", which reports the findings from Study 1.

In this review, the Knowledge-to-Action framework is applied to a specific area of blood donor research: vasovagal reactions in relation to blood donation. This is a key area of investigation within blood donor research and has a strong focus on interventional research. Therefore, research in this area has a high potential for knowledge translation.

Specifically, the objectives of this review were to a) examine the number and nature of published studies relating to vasovagal reactions to determine the availability of research evidence, and b) map the included articles along the research-to-practice trajectory using the Knowledge-to-Action framework to determine the extent of knowledge translation of vasovagal reaction research. The findings from this study provided insights into the state of knowledge translation in this area of research that informed the design of the subsequent studies.

2.2 Publication details

This chapter has been published in *Transfusion*, a leading journal in transfusion medicine:

> **Thijsen A**, Masser B, Davison TE, Kruse SP, Williamson A. Examining knowledge translation in blood donor research: A review of vasovagal reaction literature. *Transfusion*. 2021; 61(6):1772–1779. https://doi.org/10.1111/trf.16391

The article includes the following supplementary materials:

- Table S1: Overview of published knowledge inquiry studies
- Table S2: Overview of published knowledge synthesis studies

- Table S3: Overview of published knowledge tools/products studies
- Table S4: Overview of published implementation and evaluation studies
- List of included articles by category

2.3 Dissemination details

The work included in this chapter has been presented at the following conference:

> **Thijsen A**, Masser B, Davison TE, Kruse SP, Williamson A. Examining knowledge translation in blood donor research: a review of vasovagal reaction literature. *4th European Conference on Donor Health & Management*. Hamburg, Germany (virtual). September 15-17, 2021.

2.4 Authors' contributions

AT designed the study and conducted the literature searches. AT and SPK performed the screening and classification of the included articles. AT extracted the data of included articles and drafted the manuscript. AW, BM, and TED provided guidance in terms of the study design and manuscript preparation.

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TRANSFUSION

Examining knowledge translation in blood donor research: A review of vasovagal reaction literature

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Abstract

Background: Knowledge translation focuses on the transfer of research findings into policy and practice. To provide insight into the state of knowledge translation in blood donor research, we undertook a rapid review of a key research area in the field with high potential for translation, vasovagal reactions (VVRs). We examined the number and nature of VVR-related studies to determine the availability of research evidence, and mapped the included articles along the research-to-practice trajectory using the Knowledge to Action framework.

Study Design and Methods: PubMed, PsycINFO, CINAHL, and EMBASE were searched for peer-reviewed journal articles from inception to October 2019 using the terms blood don* AND vasovagal OR faint* OR syncope.

Results: A total of 176 articles met our inclusion criteria. Studies relating to VVRs increased substantially from 1942 to 2019, with 84% published in the last 20 years. Articles were predominately observation (non-intervention) studies (117; 66%), followed by intervention (knowledge inquiry) studies (31; 18%) and review (knowledge synthesis) studies (20; 11%). The evidence from intervention research was limited, with 14 strategies tested in 31 studies and often by the same research groups. Only 5 (3%) implementation and evaluation studies were found; all focused on evaluating the effects of a newly introduced intervention on VVR rates through uncontrolled or cross-sectional study designs.

Discussion: VVR research is in the early stages of knowledge translation. More intervention research is needed to provide a robust evidence base as well as more published implementation research to share knowledge of translating research into policy and practice.

KEYWORDS

blood donation, knowledge to action framework, knowledge translation, rapid review, vasovagal reaction

1 | INTRODUCTION

Donors are essential to blood collection agencies worldwide. Donor research provides a major contribution to our understanding of donor recruitment, retention and health issues, and can produce evidence to guide blood collection practices.

While transfusion medicine research has focused predominantly on blood product usage, there has been a rise in the last two decades in the number of studies focused

on donors.[1] For example, in their initial review of factors that affect a donor's risk of a low hemoglobin deferral, Smith and colleagues[2] identified 55 studies published between 1980 and 2012. In their recently published updated review, they found an additional 76 studies published between 2012 and 2019.[3] This demonstrates an expansion at an increasing rate in the knowledge of blood donor recruitment, behavior, and health issues.

However, increasing scientific knowledge alone is insufficient to ensure the application of this knowledge in practice. Implementing research into practice is notoriously difficult. It relies on the quantity and quality of available evidence,[4] on staff having the knowledge, motivation, and skills to be able to apply the evidence in practice,[5] and on a supportive implementation climate within an organization.[6–8] Further, there is also the potential problem of a growing body of evidence, which may hinder practitioners' ability to keep up to date.[9] Research shows that, without dedicated implementation strategies, it takes an average of 17 years for research knowledge to become embedded into practice.[10] Blood collection agencies are busy environments; blood collection teams are faced with competing demands, which may affect their ability to stay up to date with relevant literature and implement evidence-based practice changes, while policy makers often do not have the time or opportunity to use research evidence without the support of the organization.[11] Further, researchers often use different terms and methods to practitioners and policy makers, have different educational backgrounds, and work to different timescales and priorities. This may result in them not properly understanding each other and hinder the translation of evidence to routine practice.[5]

In recognition of this issue, there has been increased interest in methods to close the gap from knowledge to practice, often referred to as knowledge translation.[9] Knowledge translation moves beyond dissemination of knowledge (i.e., publishing findings in journals and presentations) toward actual use of knowledge.[12] It is defined as the "synthesis, dissemination, exchange and ethically sound application of knowledge to improve patient health, provide more effective health services and products and strengthen the health care system".[13,14] To the best of our knowledge, however, knowledge translation has not yet been examined in relation to blood donor research.

A prominent model in knowledge translation is the Knowledge to Action framework, which maps the process for translating research into practice by integrating the roles of both knowledge creation and knowledge application (see Figure 1).[15] At the center of the model, knowledge is created and moves through a funnel comprising three phases: knowledge inquiry (first generation knowledge), knowledge synthesis (second generation knowledge), and knowledge tools and/or products (third generation knowledge). As knowledge moves through each phase in the funnel, it becomes more distilled or refined, becoming potentially more useful to end-users. Situated around the knowledge creation funnel is the action cycle which represents the activities required for the implementation or application of knowledge. These dynamic action phases facilitate the selection of appropriate study designs to address barriers, the implementation of tailored interventions, the evaluation of outcomes, and the sustained use of knowledge.[9,14,15]

The aim of this rapid review is to apply the Knowledge to Action framework to a specific area of blood donor research, vasovagal reactions (VVRs) in relation to blood donation, to explore where the published literature sits within the research-to-practice trajectory. By mapping the existing published literature against the framework, it will provide insight into the state of knowledge translation in blood donor research. The review focuses on publications concerning VVRs, given that this is a key area of investigation within blood donor research, with a strong focus on interventional research that has the potential to change usual care.[16] Specifically, we will examine the number and nature of VVR publications over time to determine the availability of research to be translated, categorize the articles to determine where they sit in the research-to-practice trajectory to understand the extent of knowledge translation of VVR research, and examine the number, location, and study designs of articles in each category to explore the potential for the uptake of knowledge.

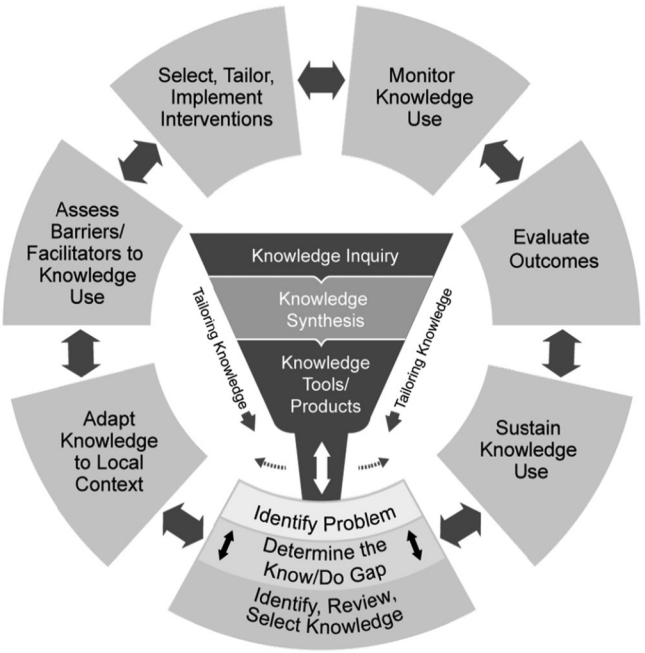

FIGURE 1 The Knowledge to Action framework

2 | MATERIAL AND METHODS

2.1 | Data sources and search strategy

Methods of the search strategy, inclusion criteria, and analysis were specified in advance and documented in a (unpublished) protocol. PubMed, PsycINFO, CINAHL, and EMBASE were searched for peer-reviewed journal articles focusing on VVRs in blood donation. The search terms used were blood don* AND vasovagal OR faint* OR syncope. Searches were limited to those journal articles written in English, and published in a peer-reviewed journal. No date limits were applied. The search was performed on 14 October 2019.

2.2 | Exclusion criteria

Publications were excluded if they did not discuss VVRs, and did not relate to allogeneic blood donation (e.g., donated blood for autologous reasons). Gray literatures were excluded, which included conference abstracts, letters to the editor, and case reports. When multiple papers derived from a single study or trial were identified, information regarding the methods and results of the study or trial was collected from each publication and grouped together in the relevant tables.

2.3 | Screening

The rapid evidence assessment approach[17,18] was used to review the literature systematically. First, the primary reviewer independently screened the titles and abstracts of all records identified by the searches. To perform double sifting, the second reviewer independently screened a random sample of 20% of titles and abstracts. The percentage of agreement between the two screeners was 91% ($\kappa = 0.81$) and any disagreements were resolved by retrieval of the full publication and consensus agreement. Next, the primary reviewer assessed all full texts deemed potentially relevant for inclusion. The second reviewer independently screened a random sample of 20% of full texts; any disagreements were resolved by consensus (91% agreement).

2.4 | Classification

The included articles were categorized using the Knowledge to Action framework:

1. *Knowledge inquiry*: First-generation knowledge regarding the efficacy or effectiveness of interventions, including randomized controlled trials and quasi-experimental designs.
2. *Knowledge synthesis*: Second-generation knowledge represents the aggregation of existing knowledge, which includes systematic reviews, meta-syntheses, and narrative reviews.
3. *Knowledge tools/products*: Third-generation knowledge consisting of tools or products to present knowledge in a clear, concise, and user-friendly format to facilitate the uptake and application of knowledge such as clinical guidelines.
4. *Implementation and evaluation*: The implementation or application of findings from knowledge syntheses to clinical practice, including the evaluation of whether the application of knowledge actually makes a difference in terms of VVR rates.

The first three categories encompass the knowledge creation funnel, and the last category includes studies in the action cycle. We also used another category to capture studies sitting outside of the framework:

5. *Non-intervention*: These were identified as studies observing the phenomenon rather than manipulating it, including descriptive studies, cohort studies, cross-sectional studies and case–control studies. The number of these studies published was captured in this review, but the individual studies were not described and no data were extracted.

The rapid evidence assessment approach was also used to categorize the articles: the primary reviewer categorized all included articles and a random sample of 20% of articles were subjected to a second, independent categorization as a quality control measure by the second reviewer, with any disagreements resolved through consensus (93% agreement).

2.5 | Data extraction

Data were extracted to MS Excel. Information was extracted from each included article on: (1) characteristics of the study (including study objective, interventions tested, design, study period, and country); (2) characteristics of the sample (including sample size, age, gender, donation history, and phlebotomy type); and (3) main findings of the study (including a description of the main findings, group differences, significant and non-significant VVR risk factors, and any information on implementation).

3 | RESULTS

The original search returned 532 citations, which, once duplicates were removed, left 290 unique citations to be screened for inclusion (see Figure 2). After citations that did not meet the selection criteria were excluded, 145 papers remained. Thirty-one additional citations were identified by scanning the reference lists of the included papers. Two publications were removed from the analysis as a copy of the full text could not be obtained. As such, 176 papers were included in this review.

3.1 | VVR publications over the years

Figure 3 shows the number of VVR publications per decade. With the exception of the 1950s in which no publications were found relating to VVRs, only a handful of VVR studies were published each decade, ranging from

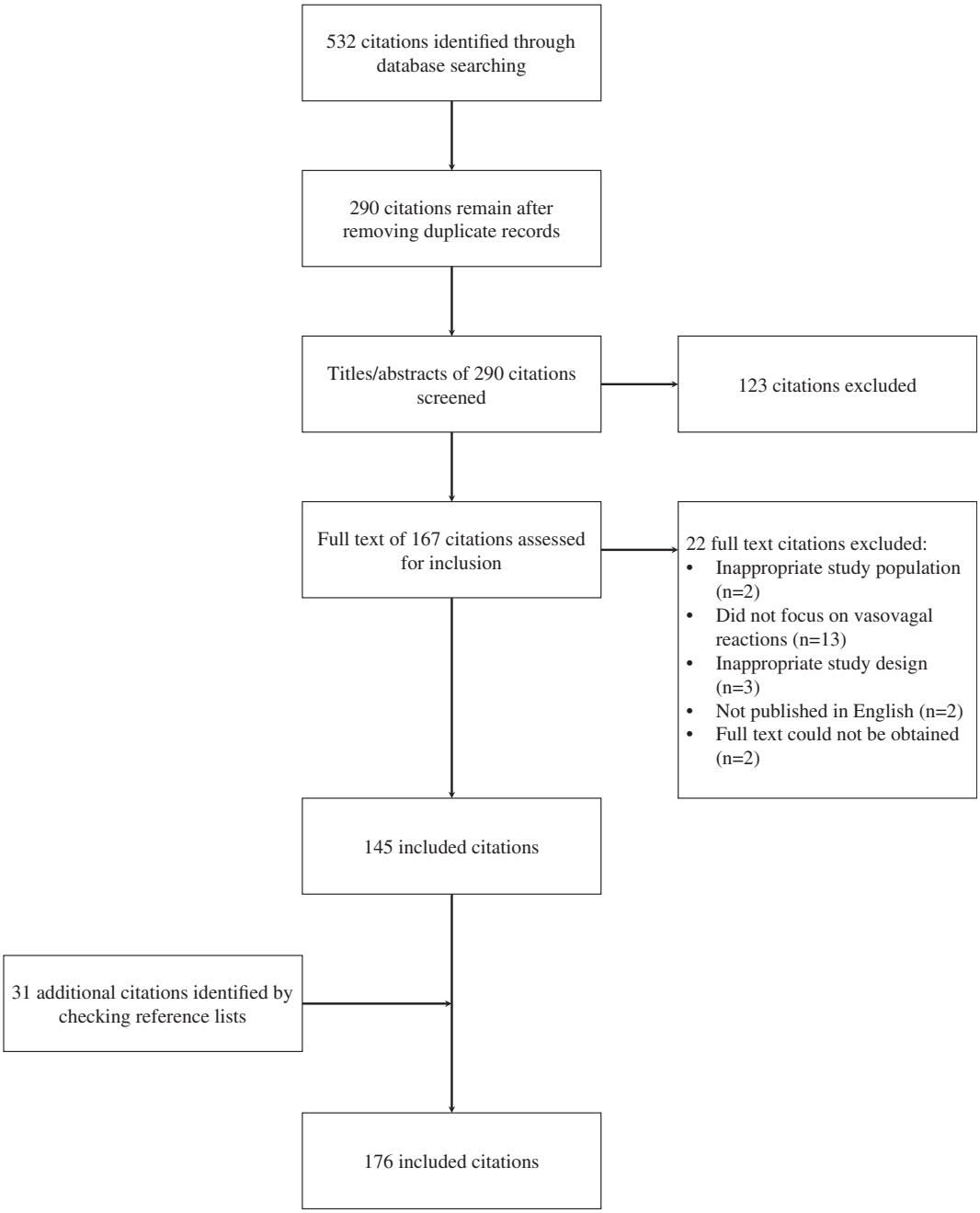

FIGURE 2 Identification of included studies

2 to 11, between the 1940s and 1990s. In contrast, the majority of research (n = 148; 84%) on VVRs has been published in the last two decades, with more than half (n = 100; 57%) published between 2010 and 2019.

Research on VVRs has been published from 28 different countries. The first studies found on the topic of VVRs were published in 1942 from the United Kingdom. However, most studies since have been conducted in the United States (n = 72; 40%), followed by Canada (n = 22; 12%), India (n = 17; 9%), and Australia and Japan (each n = 9; 5%).

3.2 | The research-to-practice trajectory

Figure 3 also displays the categorization of the publications along the research-to-practice trajectory. The included articles were categorized as follows: 117 (66%) non-intervention studies, 31 (18%) knowledge inquiry studies, 20 (11%) knowledge synthesis studies, 3 (2%) knowledge tools/products studies, and 5 (3%) implementation and evaluation studies. A list of the included articles in each category is provided in the Supplementary Materials.

Articles published before 2000 were predominately non-intervention studies (n = 23; 82%), followed by knowledge synthesis studies (n = 3; 11%), and knowledge inquiry studies (n = 2; 7%). From 2000, we observed an increase in the proportion of knowledge inquiry studies (n = 29; 20%), and the first knowledge tools/products (n = 3; 2%) and implementation and evaluation studies (n = 5; 3%) were published. While the proportion of non-intervention studies decreased over time, published VVR research remained predominantly non-interventional even after the year 2000 (n = 94; 64%).

3.3 | Knowledge inquiry studies

Thirty-one articles generating new knowledge through interventions were identified in the literature. These studies evaluated a range of interventions to reduce donor risk of VVRs: eight articles focused on applied muscle tension, six articles focused on water loading, and six articles focused on changing donor eligibility criteria. A further three articles investigated applied muscle tension in combination with another intervention: one examined the combination with water loading, one with water loading and an isotonic drink, and one with calm breathing. The other interventions tested included caffeine, distraction, donation intervals, emotional support, psychological approach, salt supplementation, social support, and vein visualization technology, with one study evaluating each intervention. The majority of knowledge inquiry studies were randomized controlled trials (n = 16), followed by non-randomized controlled trials (n = 9), cluster-randomized controlled trials (n = 3), and non-experimental studies (n = 3). More than half of these studies were conducted in the United States and Canada. Details of the knowledge inquiry articles are presented in Table S1.

3.4 | Knowledge synthesis studies

Of the 20 articles synthesizing knowledge of the VVR prevention and management literature, 16 articles were narrative reviews and only four were systematic reviews. Most of the narrative reviews focused on describing the types of adverse events associated with blood donation, identifying risk factors, and describing potential risk reduction strategies. Eleven of the 16 narrative reviews were published by authors from the United States, with two authors contributing seven articles. Of the four systematic reviews, one focused on identifying risk factors for syncope, one on the effects of low blood pressure, one on the effects of epilepsy, and one on interventions to reduce VVRs. All but the first concluded that there was limited evidence to support the identified risk factors

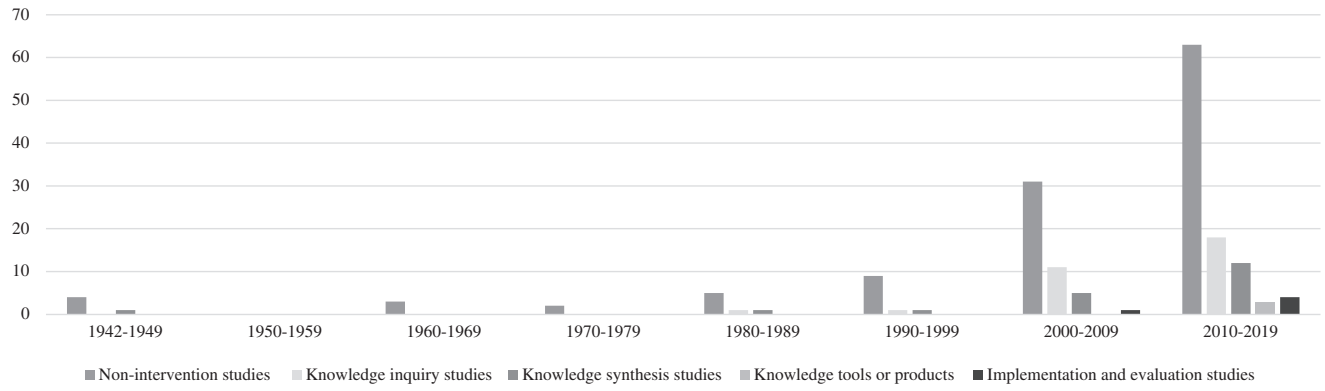

FIGURE 3 Number of VVR publications by knowledge-to-action category per decade between 1942 to 2019

(low blood pressure or a history of epilepsy) or prevention strategies. An overview of the knowledge synthesis articles is provided in Table S2.

3.5 | Knowledge tools and/or products studies

Three knowledge tools/products studies were identified. The first article was a descriptive study of a new standardized system for monitoring donor adverse events in Italy. The second article was a cross-sectional study and a randomized controlled trial evaluating donor educational materials to improve the uptake of VVR prevention strategies in Australia. The third was a deductive research study combining knowledge of an unknown number of studies identifying VVR risk factors to develop a predictive model in Spain. Table S3 presents an overview of the knowledge tools/products studies.

3.6 | Implementation and evaluation studies

Of the five publications focusing on the implementation or evaluation of VVR prevention or management, three evaluated the effects of changing blood donation eligibility criteria on VVR rates, whereas the remaining two evaluated newly introduced practice changes to reduce the risk of VVRs among young, whole blood donors. All studies focused on evaluating the effects of an intervention on VVR rates through uncontrolled before-and-after study designs or cross-sectional study designs. No studies were identified that focused on implementation. Details of the identified articles are presented in Table S4.

4 | DISCUSSION

In our review, we examined the broad patterns of knowledge translation in VVR-related research using the Knowledge to Action framework. We found that most of the articles were situated at the beginning of the knowledge funnel, with fewer studies in each category as we progressed through the research-to-practice trajectory. Only five implementation and evaluation studies were identified in the literature indicating that knowledge translation is in the early stages in this field of research.

We identified three possible explanations for the state of knowledge translation in VVR research. First, VVR-related research is a relatively recent field of inquiry. While the first studies relating to VVRs were conducted in the 1940s, we found that 84% of VVR research was published in the last two decades. Importantly, more than half of all studies were published after 2010 indicating an exponential increase in VVR research. The relative recency of VVR research may affect the uptake of evidence into policy and practice. Time is an important factor in knowledge translation, with the average time taken to embed research evidence into clinical policy and practice estimated at 17 years.[10] The field of VVR research may be too young to fully see the effects of knowledge being translated into policy and practice.

Second, the volume of research evidence available for knowledge translation is low. Only 31 knowledge inquiry studies relating to VVRs were identified. In comparison, a similar review applying the Knowledge to Action framework to stroke rehabilitation literature found 70 knowledge inquiry studies published in 2016 alone.[5] Further, the interventions under investigation in the knowledge inquiry studies have been diverse, with 14 different strategies tested. Only three of these strategies, applied muscle tension, water loading, and changing donor eligibility criteria, have been evaluated in multiple studies in a variety of donation settings. Unsurprisingly, these strategies were the only ones to progress through the research-to-practice trajectory and were the focus of the implementation and evaluation studies. In order to progress knowledge translation in this area, more knowledge inquiry studies are needed. These must be performed in a variety of settings to provide policy makers and practitioners with a solid evidence base for VVR risk reduction strategies. A similar conclusion was drawn by three of the four systematic reviews conducted in this area.[19–21]

Third, the quality of evidence available for knowledge translation is suboptimal. Most of the research conducted in relation to VVRs has been observational with relatively few intervention studies. This may be explained by the fact that observational research, such as the analysis of large datasets, is much easier to conduct and cheaper and quicker to complete than intervention research. Further, there may be pragmatic challenges associated with conducting interventions, which involves identifying and engaging donors, blood collection staff, and/or blood collection agencies. Intervention studies also require large sample sizes to be adequately powered as only a small proportion of donors have a registered VVR. The suboptimal quality of evidence is also found further down the knowledge funnel, with the majority of knowledge synthesis studies being narrative reviews. These types of reviews are often written by experts to provide their perspectives on a specific topic, whereas systematic reviews are based on the findings of a comprehensive and systematic literature search to minimize selection bias. Therefore, there is a need not only to increase the volume of

VVR research but also to conduct more rigorous intervention studies and systematic reviews to ensure the best possible evidence is available for translation into practice.

While the emergence of publications of implementation and evaluation studies in VVR research is promising, further work is required to enhance the uptake of evidence in policies and practice. Both studies that evaluated the introduction of applied muscle tension and water loading reported issues around compliance.[22,23] It is important to not only evaluate summative endpoint health outcomes such as VVR rates, but also assess the extent to which the implementation was effective in order to optimize intervention benefits, ensure sustainability of the intervention, and to translate the implementation findings to other contexts.[24] Researchers could look to papers such as by Lynch and colleagues[25] for guidance on how to conduct formative evaluations. It is also important to note that some blood collection agencies may routinely implement changes to practice based on recent evidence without the resources, capacity, or links to researchers to evaluate them. The academic community could support blood collection agencies through collaborative implementation research.

This review has had a number of limitations. We excluded gray literature from our review as our aim was to evaluate the published literature which provides knowledge that is easily accessible to practitioners and policy makers. Due to its diverse formats and intended audiences, gray literature can be harder to find, more time consuming to locate and may not be easy to understand.[26] However, it is recognized that some policy makers and practitioners may source information from conference attendance. It is also important to acknowledge that we narrowed our search terms to focus on vasovagal reactions and excluded broader terms such as adverse events and donation complications. While this approach aligns with search terms used in other systematic reviews conducted in this research area,[27] it may have resulted in the exclusion of some VVR-related studies.

Despite these limitations, this review highlights the important work that needs to be done to progress knowledge translation in the field of blood donor research. Given the ongoing need for blood and blood donors, it is imperative that more knowledge inquiry studies are conducted and importance is placed on publishing implementation and evaluation work to ensure blood collection agencies benefit from the best possible evidence to inform policy and practice.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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Supplementary Materials

Table 1 Overview of published knowledge inquiry studies (n=31)

Study	Country	Study Design	Focus area	Research question	Study population	Main findings
Pindyck et al., 1987	USA	Non-randomised controlled trial	Changing eligibility criteria	To measure the feasibility and safety of blood donation by healthy elderly donors aged 66 years and older, compared with a younger cohort aged 55 to 65 years of age.	5123 regular whole blood donors	A decrease was found in the incidence of mild reactions with advancing age.
Sauer & France, 1999	USA	Randomised controlled trial	Caffeine	To investigate the effects of low (125mg) and moderate (250mg) doses of caffeine on physiological and psychological responses to blood donation.	62 first-time, female, undergraduate whole blood donors	Donors who consumed moderate doses of caffeine reported lower vasovagal symptoms and fewer chair reclines compared to the control group, with donors who consumed the low dosage sitting in the middle.
Bonk, France, & Taylor, 2001	USA	Randomised controlled trial	Distraction	To assess the effect of visual distraction on VVRs in novice blood donors.	112 first-time whole blood donors	Donors with blunting coping style in the distraction group had significantly lower vasovagal symptoms than the control group, but no effect was found in donors with a monitoring coping style.
Ditto, France et al., 2003	Canada	Randomised controlled trial	Applied muscle tension	To assess the effect of applied muscle tension in reducing VVRs.	605 whole blood donors recruited at mobile clinics in colleges and universities	Women in the AMT condition reported significantly fewer VVR symptoms and required less treatment than women

						assigned to the no-treatment and placebo control conditions. No effect found in men.
Ditto, Wilkins, et al., 2003	Canada	Randomised controlled trial	Applied muscle tension	To evaluate applied muscle tension (AMT) in reducing VVRs in inexperienced blood donors.	178 whole blood donors with less than 3 prior donations who donated at mobile locations only	Donors who used AMT reported fewer VVR symptoms and required less chair reclining than those in the control group.
Hanson & France, 2004	USA	Randomised controlled trial	Water loading	To assess the effect of predonation water ingestion on negative physiologic reactions to blood donation.	83 first-time whole blood donors aged 18 to 26 years	Predonation water consumption was associated with a reduction in VVR symptoms.
Ditto & France, 2006	Canada	Randomised controlled trial	Applied muscle tension	To evaluate the effects of applied tension on blood donation related symptoms in a group of young adult, French-speaking blood donors.	467 whole blood donors who donated at mobile locations only	Vasovagal symptoms were significantly lower in those assigned to the AT condition compared to both the no treatment and placebo control conditions.
Ditto et al., 2007	Canada	Randomised controlled trial	Applied muscle tension	This study was a randomized controlled trial of different components of applied tension (AT) focusing on the relative importance of expectation, upper- and lower-body muscle tension, and distraction.	1209 whole blood donors recruited at mobile clinics in colleges and universities	Donors assigned to the full AT condition reported fewer vasovagal symptoms, with the lower-body tension condition being most similar to the full AT condition.
Newman et al., 2007	USA	Randomised controlled trial	Water loading	To evaluate the effect of a 473-mL (16-oz) water drink on vasovagal donor reaction rates in high-school students.	8894 whole blood donations from high-school donors aged 16 to 18 years	Donors in the water loading group had significantly lower VVR rates compared to the control group.
Ando et al., 2009	Japan	Non-randomised controlled trial	Water loading	To assess if water ingestion reduced the incidence of VVR in high-risk donors identified using a simple standing test before and after blood collection.	210 whole blood donors	Water ingestion significantly reduced VVRs in high-risk donors.

Ditto et al., 2009	Canada	Randomised controlled trial	Applied muscle tension	To examine the psychophysiological effects of applied tension (AT) in the context of blood donation.	98 whole blood donors studying at a university	Donors who practiced AT were less likely to report VVR symptoms, displayed stable heart rate, and high-frequency heart rate variability.
Fujitani et al., 2009	Japan	Non-randomised controlled trial	Changing eligibility criteria	To evaluate the safety of 400-ml whole-blood collection in 17-year-old males.	322 17-year old male whole blood donors; 363 18- to 19-year old male whole blood donors	There was no significant difference in the rate of VVRs between the two age groups.
Hanson & France, 2009	USA	Randomised controlled trial	Social support	The study hypothesized that the presence of a supportive person during the donation process may help reduce reactions.	65 whole blood donors with less than 3 prior donations, aged 18 to 57 years.	Donors in the social support condition reported significantly fewer VVR symptoms than the standard donation controls.
France et al., 2010	USA	Randomised controlled trial	Applied muscle tension; water loading	To examine the combined effect of pre-donation hydration and repeated muscle tension on the experience of presyncopal reactions to blood donation.	414 whole blood donors with less than 2 prior donations	There were significantly fewer VVRs in the water, and water and leg exercise groups relative to the placebo but not to standard donation.
Rios et al., 2010	USA	Cross-sectional study	Changing eligibility criteria	We conducted a study of the relationship of risk factors such as weight, height, and estimated blood volume, with prefaint and systemic vasovagal reactions (SVRs) among donors of allogeneic whole blood as young as 16 years old.	591,177 whole blood donors aged 16 to 22 years	Stricter donor criteria for younger donors would significantly reduce the rate of VVRs with minimal impact on number of potentially deferred donors.
Dunbar et al., 2011	USA	Cross-sectional study	Changing eligibility criteria	To determine the impact of new donor height and weight criteria on collections and donor faint and prefaint reaction rates.	537 whole blood donors aged 16 to 22 years from undergraduate campus blood drives	Stricter donor criteria would result in higher donor deferral rates with limited impact on VVR rates.

Holly, Balegh, & Ditto, 2011	Canada	Randomised controlled trial	Applied muscle tension	To examine the relative roles of exercise-related cardiovascular activity versus anxiety reduction in the effects of applied tension on vasovagal symptoms.	1254 whole blood donors with less than 5 donations, aged 18 to 40 years	Participants who were more afraid of needles reported significantly more vasovagal symptoms. The benefit of applied tension was mostly limited to people who reported higher levels of needle fear.
Zeiler et al., 2011	Germany	Non-randomised controlled trial	Changing eligibility criteria	To assess whether there is an increased risk of donor reactions in elderly donors.	64,260 whole blood donations by regular donors aged 50 to 71 years	The rate of adverse reactions decreased with age.
Holly, Torbit, & Ditto, 2012	Canada	Randomised controlled trial	Applied muscle tension	To examine the effects of applied tension by looking at its impact on blood donation-related anxiety, physiological activity, and vasovagal symptoms and more thoroughly study the impact of the timing of applied tension on these measures.	282 whole blood donors aged 18 to 40 years	Practising applied tension before and during donation significantly decreased vasovagal symptoms, but no effect was found in the number of donors fainting.
Müller-Steinhardt et al., 2012	Germany	Cross-sectional study	Changing eligibility criteria	To evaluate donor safety and potential risks for repeat donors aged 68 to 70 years.	723,606 whole blood donations from donors aged 18 to 70 years	The rate of donor adverse events declined with age.
Pagliariccio & Marinozzi, 2012	Italy	Non-randomised controlled trial	Psychological approach	To evaluate whether a psychological approach based on a path of three step approach will be more effective in preventing vasovagal events and in influencing the donors' return, than a psychological interview alone.	387 first-time whole blood donors	The psychological approach resulted in a significant reduction in the intensity and frequency of VVR symptoms compared to the control group.
Van den Berg et al., 2012	South Africa	Cluster-randomised controlled trial	Water loading	To measure the efficacy of water preloading in reducing syncope and presyncope events among school age donors in the Eastern Cape of South Africa.	2466 high-school whole blood donors aged 16 to 20 years	There was no difference in VVR rates between the study conditions.

Pagliariccio et al., 2013	Serbia	Non-randomised controlled trial	Emotional support	To investigate if emotional support given during donation to first-time donors could be effective in a group even with different ethnical, cultural and social characteristics.	200 first-time plateletpheresis donors (FTPltFDs); 300 first-time whole blood donors (FTD); 200 repeat whole blood donors; 100 psychologically approached Italian first-time donors	Compared to FTDs (control), fewer FTPltFDs (intervention) experienced fewer anxiety-related and vasovagal symptoms.
Vavic et al., 2014	Serbia	Non-randomised controlled trial	Water loading	The hypothesis of this study is that giving donors something to drink has a placebo effect in preventing fainting and pre-fainting symptoms only when psychological discomfort linked to donation is not too intense.	3656 first-time whole blood donors aged 18 to 19 years	Donors in the intervention group had significantly lower rate of VVRs compared to the control group.
Morand et al., 2016	France	Cluster-randomised controlled trial	Isotonic drink; mineral water; applied muscle tension	To compare three different predonation hydration strategies (isotonic drink, mineral water, or the usual advice to drink water) coupled or not with muscle tensing exercise (leg, foot, and abdominal) during the donation, on the prevention of syncopal-type reactions during whole blood donation and in the following 48 hours.	4576 whole blood donors	Drinking the isotonic solution or water significantly reduced VVRs. Muscle tensing exercises significantly reduced syncopal-type reactions during donation. Isotonic drink significantly reduced delayed VVRs.
Waller et al., 2016	Australia	Randomised controlled trial	Vein visualisation technology	To investigate the efficacy of Vein Visualisation Technology (VVT) in blood donation and determine the impact of VVT on collection success, donor experience and phlebotomist experience during whole blood donation.	872 whole blood donors aged 18 to 30 years	No significant differences in vasovagal symptoms or phlebotomist registered VVRs across conditions.
Di Angelantonio et al, 2017	UK	Randomised controlled trial	Donation intervals	To assess the effect of different inter-donation intervals on blood supply and donor health over a 2-year period.	45,042 whole blood donors	More frequent donations resulted in more VVR-related symptoms than those observed in the

						standard frequency groups but no effect found on recorded faints.
Sachdev et al., 2017	India	Non-randomised controlled trial	Salt supplementation	To evaluate the effect of pre-loading with salt in form of salt loaded water on immediate VVRs post blood donation.	1000 college going, whole blood donors	No significant difference found in VVR rate between the study conditions.
Thijsen et al., 2018	Australia	Randomised controlled trial	Applied muscle tension	This study evaluated whether using AMT at three different time points during the donation procedure reduces the VVR symptoms reported by donors and the VVR reactions recorded by phlebotomists.	734 whole blood donors aged 18 to 71 years	Donors in the time points group had significantly lower number of phlebotomist registered VVRs compared to control group. No effect found on self-reported symptoms.
Mennitto et al., 2019	Canada	Randomised controlled trial	Applied muscle tension; calm breathing	To examine the effects of an "anti-hyperventilation" respiration control procedure individually and in concert with applied muscle tension to reduce vasovagal symptoms.	547 whole blood donors aged less than 30 years with less than 10 prior donations	Less fearful donors who practised respiration control and/or applied muscle tension reported significantly fewer VVR symptoms than the no-treatment control group. No effects were found for more fearful donors.
Wiersum-Osselton et al., 2019	The Netherlands	Cluster-randomised controlled trial	Water loading	To investigate the effects and acceptability of drinking 330 or 500 mL water compared to a control intervention shortly before phlebotomy, and a questionnaire-only condition where standard donor care was given.	8300 whole blood donors with less than 5 donations, aged 18 to 30 years	Drinking 330 or 500mL of water reduced onsite vasovagal symptoms in novice donors (2-4 donations) only. No effect found on phlebotomist registered VVRs.

Table 2 Overview of published knowledge synthesis studies (n=20)

Study	Country	Study Design	Research question	Number of studies included	Study population/ restrictions	Main findings
Boynton & Taylor, 1945	USA	Narrative review	To describe complications arising in blood donors.	Unknown	Unknown	The incidence of VVR ranges between 2.8-8.9%. Risk factors include gender, age, number of donations, body weight, occupation, history of fainting, and feeling apprehensive.
Grindon, 1982	USA	Narrative review	To provide an overview of adverse events in relation to blood donation, with a particular focus on risk factors.	Unknown	Whole blood donors, USA-based research only	The incidence of a VVR is 2.5% based on observation alone, and 7% based on observation and an interview 3 weeks later. A VVR is more common in young, low-weight, female and first-time blood donors.
Newman, 1997	USA	Narrative review	The prevalence, characteristics, causes, and clinical significance of donor reactions and injuries is the subject of this review.	Unknown	Whole blood donors	2-5% of whole blood donors experience a VVR, with most occurring suddenly at the end of the phlebotomy or shortly after its completion. Risk factors include age, a previous VVR, anxiety (first-time donor), low body weight, epidemic fainting, and an inattentive/noncommunicative phlebotomist. Treatment includes placing the donor in a Trendelenburg position, to change their breathing pattern, and physical stimulation through cold towels and ammonia salts. VVRs can be prevented by careful and attentive care of the donor.
Newman, 2004a (Curr Opin)	USA	Narrative review	This article reviews the common and uncommon adverse events that occur during or after whole-blood donation and emphasizes the	Unknown	Whole blood donors, USA-based research only	The incidence of VVRs is 2-3% based on observation alone, and 7% based on observation and post-donation interview. Major contributing factors were age, body weight, first-time donor status, ethnicity, and

			advances in knowledge obtained during the last several years.			gender. For every syncopal reaction, there are 25 presyncopal reactions. VVRs decrease donor return between 30-76%. VVRs can be prevented by collecting a smaller volume using an automated apheresis machine, water loading, and reducing collected volume.
Newman, 2004b (Curr Hema)	USA	Narrative review	The purpose of this review is to provide information and references for clinicians so that they understand the reasons for blood donor deferrals, the nature of the collection process, and some of the common and uncommon donor complications after phlebotomy.	Unknown	Whole blood donors, USA-based research only	Same VVR information presented as Newman (2004a).
Popovsky, 2004	USA	Narrative review	This paper examines the safety of manual and automated blood donation.	Unknown	Unknown	2-5% of whole blood donations are associated with VVRs. Syncope occurs in 0.08-0.34% of cases. Two-thirds of hospitalisations due to blood donation are a result of VVRs. Risk factors of VVRs are young age, weight, and donation status. Predonation blood pressure or pulse and gender are not predictive. In plateletpheresis, the incidence of VVRs is 0.5%.
Boulton, 2008	UK	Narrative review	This review addresses several points surrounding donor selection and the peculiar nature of the blood donation phenomenon with its potential to harm a healthy individual in order to provide a therapeutic product,	Unknown	Literature up to September 2007, excluded apheresis donations	Standardised collection volumes have a pragmatic rather than a scientifically determined origin. The development of 'Donor Adverse Events Registers' have aided in more systematic monitoring of events. 4% of all whole blood donors experienced VVRs and were largely determined by age, weight

			particularly when that healthy individual is unremunerated; it also aims to promote the specific science of donor selection.			and first-time donor status. Reducing collection volumes may prevent VVRs.
Eder et al., 2009	USA	Narrative review	This review focuses on the donor selection criteria that have been voluntarily adopted, or enforced through regulation, in different countries that are intended to protect the safety of the blood donor.	Unknown	Unknown	Many donors are still deferred based on characteristics that have low or no demonstrated predictive value for VVRs, and the donor loss through such a nonspecific approach is substantial. Current deferral policies could be further refined with careful study while protecting blood donor safety
Reiss & Kessler, 2010	USA	Narrative review	To provide an overview of complications related to whole blood donation.	Unknown	Whole blood donors	Donor reactions occur with increased incidence among teenage donors and, when associated with syncope, may lead to significant injury. Despite a wide variety of behavioural interventions being implemented, no reduction in the rate of VVRs was observed. Increasing minimum weight requirements or redirecting teenage donors to automated apheresis should be considered.
Bani & Giussani, 2010	Italy	Narrative review	To compare the presence of women among blood donors in different European countries and examine the roles that gender is reported to play in the donation of blood in order to identify possible implications for communication with and management of the donor.	Unknown	Articles published in blood transfusion journals, between 1994 to 2009	There is a higher incidence of VVRs among women, although gender alone does not explain the difference, which is mediated by other factors such as weight and age. Applied muscle tension was found to be particularly effective in reducing reactions in women and in increasing return rate. Water loading or social support did not show differences between men and women.
Wieling et al., 2011	The Netherlands	Narrative review	The aim of this review is to describe the application of	Unknown	Whole blood donors, syncope only	Syncope occurs most frequently when the needle is removed, and when the donor

			lower-body muscle tensing, plasma volume expansion, and water drinking in the light of the recently published time course of vasovagal reactions in the setting of whole blood donation.			moves from a recumbent to an upright position. It is recommended donors use lower-body muscle tensing exercises, take salt supplementation, and use water loading to prevent syncope.
Amrein et al., 2012	Austria	Narrative review	A comprehensive review on adverse events addressing all types of blood donation including whole blood, plasma, platelet, peripheral blood stem cell, leucocyte and bone marrow donation, with strategies outlined for the prevention and treatment of these events and future research directions.	Unknown	All donation types	Blood donation is associated with a variety of potential complications, with the most common adverse events including iron deficiency, circulatory effects (all types of donation) and citrate-related events (only in apheresis donors). For some adverse events, effective strategies for prevention or treatment have been reported but are not yet in routine use.
Eder, 2012a (Curr Opin)	USA	Narrative review	This review examines recent research on syncope after whole blood donation and efforts by blood centers to improve safety for young blood donors.	Unknown	Teenage blood donor studies only, published between 2010 to 2012	Informing donors about potential VVRs, preventive measures, and coping strategies may not only reduce the risk of VVR but also encourage return. Some donors may benefit from a predonation water drink and muscle tension exercises, but the effect may depend on the donor population and their susceptibility to VVRs. Newly introduced donor selection reduced VVRs, but the inconsistent application of other behavioural interventions may have limited their effectiveness.
Eder, 2012b (Transfus)	USA	Narrative review	This review examines the available data that support the use of individual interventions and the recent	Unknown	Unknown	More evidence needed to determine the effects of education, distraction, and phlebotomy staff on VVRs. The predictive value of individual donor characteristics for

			efforts by ARC and the Blood Systems, Inc (BSI), on the practical application of various strategies in combination, to reduce the risk of syncopal reactions among young blood donors.			VVRs is low and could lead to unnecessary donor exclusions. Controlled trials support the benefit of water loading and applied muscle tension in reducing VVRs, but limited knowledge on how these strategies will perform in 'real-world' settings. New donor selection criteria introduced in two blood collection agencies reduced VVRs, but inconsistent application of other strategies may have limited their effectiveness.
Newman, 2014	USA	Narrative review	This review discussed the current situation and what can be done psychologically, physiologically, and via process improvements to decrease vasovagal reaction rates and increase donor retention.	Unknown	Whole blood donors, aged 16 to 17 years.	VVR risk factors include youth, body size, first-time donation, ethnicity, sex, donor fear, phlebotomy duration, needle injuries, and sleep. VVRs decrease donor return and can result in injury. Improving the donor psychologically and physiologically, and making process improvements can prevent VVRs.
Pauwels et al., 2014	Belgium	Systematic review	To examine the effect of low predonation blood pressure as compared to normal blood pressure, on adverse events in allogeneic whole blood donors	10 studies	Addressed the correlation between donor adverse events and low blood pressure; whole blood only; narrative reviews, commentaries, letters and opinions excluded	Although the available evidence is limited and of low quality, the review showed that low blood pressure prior to blood donation has not been shown to be an independent risk factor for donor adverse events.
Fisher et al., 2016	UK	Systematic review	To formally assess the evidence from randomised clinical trials of water, applied muscle tension, social support, caffeine and other interventions to reduce fainting in blood donors.	16 studies	Randomised or quasi-randomised controlled trials of healthy blood donors (standard unit whole blood, double-dose red blood cell or platelet donors) with any interventions designed to prevent or reduce syncope or VVRs; Autologous blood donors were excluded.	Current evidence on interventions to prevent or reduce VVRs in blood donors is limited and does not provide strong support for the administration of pre-donation water or AMT during donation. Further large trials are required to reliably evaluate the effect of these and other interventions in the prevention of VVRs.

Kellens et al., 2018	Belgium	Systematic review	To critically examine the evidence with regard to adverse effects of blood donation on epilepsy patients.	3 studies	Studies in which (former) epileptic seizures were investigated as a risk factor/intervention; studies with blood donors; case reports, letters, comments, opinion pieces, and narrative reviews were excluded.	Limited low-quality studies could not demonstrate that blood donors with epilepsy are at an increased risk of adverse events. More research is needed to determine whether and how long epilepsy patients should be excluded from blood donation.
Donald et al., 2019	Canada	Systematic review	To identify risk factors associated with the development of vasovagal syncope during or following whole blood donation.	11 studies	Observational and interventional trials, case series including more than 10 participants, and randomized controlled trials. Included studies needed to contain data pertaining to syncope as a separate entity from presyncope. Case reports, studies pertaining to apheresis donation and/or autologous collection, non-English or with incomplete text were excluded.	Female sex, low body weight, low EBV, young age, new-donor status, low resting blood pressure, reduced sleep before donation, donating at a mobile site, and previous history of symptoms at blood donation were identified as risk factors for syncope during blood donation.
Thijsen & Masser, 2019	Australia	Narrative review	This narrative review examines current research on risk factors, prevention methods and management strategies for vasovagal reactions that occur during or as a result of blood donation.	Unknown	Unknown	Large-scale analyses using rigorous methodologies, which consider both observable and unobservable characteristics of donors and contextual features of the donation environment, need to be conducted. More research is needed into VVR prevention strategies for plasma- and plateletpheresis donors, and how to successfully implement strategies into routine practice. Research in the management and mitigation of the effect of VVRs is limited.

Table 3 Overview of published knowledge tools/products studies

Study	Country	Study Design	Research question	Tool/Product	Study population	Results
Garozzo et al., 2010	Italy	Descriptive study	To test a standardised system for monitoring adverse events related to blood donations.	Standardised forms	89,322 donations from six Transfusion Structures in 2018.	The new forms allowed for the systematic recording of donor adverse events. However, organisational problems, limited sensitivity, inadequate training, and poorly defined responsibilities hindered the performance of the hemovigilance program.
Thijsen et al., 2017	Australia	Study 1: cross-sectional study Study 2: randomised controlled trial	To evaluate the effectiveness of embedding newly developed web-based and on-site donor education materials to increase the use of VVR prevention techniques during blood collection.	Educational materials	Study 1: 375 adult, whole blood donors Study 2: 598 adult, whole blood donors	Providing on-site instructions is the most effective method to increase donor compliance to VVR prevention techniques. Only a few donors had seen the web-based materials. No significant effects of the techniques were found on VVRs.
Cobo Gonzalez et al., 2018	Spain	Deductive research study	To design a predictive engine of an expert system to determine the risk of Vasovagal Syndrome through the use of deductive methodology.	Predictive model	Unknown number of articles published after 2000; MESH terms blood donation, adverse effects and syncope vasovagal, and the term AND.	Variables included were sex, age, race, weight, systolic arterial pressure, diastolic arterial pressure, capillary haemoglobin, first donation, fasting time, anxiety, and environmental temperature.

Table 4 Overview of published implementation and evaluation studies

Study	Country	Study Design	Strategies implemented	Implementation year	Target group	Results
Goldman et al., 2007	Canada	Cross-sectional study	Removal of the upper age limit for donation for regular donors	2004	Regular whole blood and apheresis donors aged 71 years and over	VVR rates in donors aged 71 and over did not significantly differ from rates for donors aged 26-70 years. 54% of contacted older donors initiated external medical enquiries to continue blood donation.
Eder et al., 2011	USA	Uncontrolled before-and-after study	1) Dedicated supervisor on all blood drives with more than 25 donors; 2) Predonation educational material for high school donors and their parents; 3) Standard work guidance for staff; 4) New height and weight selection criteria for an EBV ≥3.5 L for donors younger than 19 years.	2008 (1), 2009 (2,3,4)	Whole blood donors aged 16 to 18 years at high school drives	The rate of VVRs significantly decreased after implementation of the interventions. Both strategies 2 and 3 encouraged donors to use water loading and applied muscle tension, with only partial compliance observed.
Tomasulo et al., 2011	USA	Uncontrolled before-and-after study	1) Limiting the maximum donation of donors under 23 years of age to 15% of estimated blood volume; 2) Education of donors about the benefits of applied muscle tension; 3) Encouragement to donors to drink approximately 500 mL of water in the 30-minute period before venepuncture.	2008	Whole blood donors aged 17 to 22 years	The interventions combined significantly decreased the number of VVRs. Strategy 1 was successfully implemented, with the implementation of the other two strategies reportedly being inconsistent.
Zeiler et al., 2014	Germany	Cross-sectional study	Removal upper age limit for experienced and active repeat donors.	2010	Whole blood donors aged 72 years and over	The rate of adverse reactions in donors aged 68+ was significantly lower than the general donor population.

						The proportion of blood donations from older donors increased substantially.
Salvadori et al., 2019	Italy	Cross-sectional study	Removal of lower limit of predonation blood pressure for blood donation.	2016	Whole blood donors	The policy change did not affect the rate of VVRs. Blood pressure was not significantly associated with VVRs when adjusting for other risk factors.

List of included articles by category

Non-intervention studies

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Chapter Three

Experiences of knowledge translation among researchers in transfusion medicine: Findings from an international survey study

Preface

3.1 Chapter overview

This chapter consists of a published manuscript entitled "*Experiences of knowledge translation among researchers in transfusion medicine: Findings from an international survey study*", which reports the findings from Study 2.

In this study, I examined the experiences of knowledge translation (KT) by researchers working in transfusion medicine in 29 countries using an online survey. Specifically, the objectives of this article were a) to determine the barriers and facilitators of KT experienced by researchers, and b) to identify what supports researchers believe are needed to help them in their KT efforts. Further, I examined differences in researcher experiences of KT by work setting, career stage, research type, and KT training. The findings from this study provided insights into the capacity of researchers to practice KT and informed the design of the third study.

3.2 Publication details

This chapter has been published in *Transfusion*, a leading journal in transfusion medicine:

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The article includes the following supplementary materials:

- Included survey measures
- Table S1: Participant location (country)

3.3 Authors' contributions

AT designed the study, coordinated ethics approval and data collection, analysed the data, and drafted the manuscript. BM and TED assisted with the data collection. AW, BM, and TED provided guidance in terms of the study design and manuscript preparation.

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ORIGINAL RESEARCH

TRANSFUSION

Experiences of knowledge translation among researchers in transfusion medicine: Findings from an international survey study

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Abstract

Background: Translation of research knowledge is critical to ensure transfusion medicine policies and practices reflect current evidence and so effectively support the health of blood donors and recipients, as well as ensuring ongoing blood supply. The aim of this study was to investigate the barriers and facilitators of knowledge translation (KT) among transfusion medicine researchers and determine what KT supports are needed.

Study Design and Methods: An anonymous, cross-sectional survey was distributed by emailing corresponding authors of papers in four major blood journals, emailing grant recipients in the area of transfusion medicine, posting on social media, and through an international blood operator network.

Results: The final sample included 105 researchers. Participants had a positive orientation toward KT, with few perceiving KT as not relevant to their research or beneficial for their careers. However, many reported facing difficulties practicing KT due to time constraints, competing priorities, or lack of funds or resources. Fostering relationships with stakeholders was seen as a key facilitator of KT but a number of researchers expressed difficulties engaging and communicating with them. Collaboration opportunities, protected time for KT, and access to KT resources were some of the supports researchers felt were required to help their KT efforts.

Conclusion: To minimize the knowledge to practice gap in transfusion medicine and ensure findings from research lead to improved outcomes, organizations need to support researchers in their KT efforts and facilitate interactions between researchers and research end-users.

KEYWORDS

blood, dissemination, knowledge mobilization, knowledge translation, research translation, researchers, transfusion medicine

1 | INTRODUCTION

In transfusion medicine, a vast amount of research is conducted to address problems faced by blood collection agencies. A survey study[1] exploring research activities in transfusion organizations found that internal research is primarily driven by gaps in knowledge and operational need. Many transfusion organizations employ researchers and/or have formed strong linkages with academic institutions to support their research needs. Further, many who lead research and development programs acknowledge that investments made in research need to have identifiable returns.[1]

As such, transfusion medicine has a high potential for knowledge to be translated into policy and/or practice. This pathway from knowledge to action is often referred to as knowledge translation (KT), defined as "a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve health, provide more effective health services and products, and strengthen the healthcare system" (p.4).[2] For transfusion medicine, KT can refer to applying knowledge from basic sciences to produce new blood products, screening methods or devices, or embedding knowledge from research into the policy and practice of collecting, managing, and use of blood.

Researchers can play an integral part in the KT process by producing, communicating, and promoting the uptake of research findings.[3] KT activities engaged by researchers may include developing and sustaining relationships with end-users, such as policy-makers, practitioners, and blood donors, and engaging them in the research process. Further, researchers can present research findings in a format tailored to end-users and ensure that they are accessible to this group.[3–5] However, the ability of researchers to translate knowledge often relies more on the context in which they operate, including policies, structures, and resources for KT activities, rather than solely on the strength of the research evidence.[4,6]

Little is known about how knowledge from research is being translated into policy and practice in transfusion medicine. Research outside of transfusion medicine has shown that KT is often sub-optimal, with fewer than 50% of clinical innovations ever being translated and taking 17 to 20 years to become routine practice, consequently denying, or delaying community access to effective services.[6–10] The field of transfusion medicine does not appear to be immune to this problem. A recent review of vasovagal reaction literature showed that KT is in the early stages in this research area, with few studies published on the implementation or evaluation of evidence-based strategies in practice.[11] Failure to translate knowledge gained from research can result in missed opportunities to optimize transfusion medicine policies and practices informed by current evidence. For example, incorporating strategies that have been found to minimize donor risk of vasovagal reactions can increase the number of completed collections, increase the size of the donor panel by preventing donor lapse, reduce donor risk of injury, and reduce costs to the blood collection agency due to preventing product waste, staff time, and efforts to maintain the donor panel.[12–17] Therefore, it is important to investigate KT in the field of transfusion medicine to ensure that donors, recipients, collection agencies, and the broader community can benefit from the knowledge generated through research.

The aim of this study is to gain insights into the practice of KT among researchers working in transfusion medicine. We conducted an international survey among transfusion medicine researchers to determine barriers and facilitators of KT experienced by researchers, and to identify what supports researchers believe would help facilitate KT practice. In addition, we wanted to explore whether there are differences in KT experiences for researchers working in different areas of transfusion medicine, at varying stages of their careers, and in different work settings.

2 | MATERIALS AND METHODS

2.1 | Study design and procedure

Using a cross-sectional survey, data were collected and managed using REDCap electronic data capture tools hosted by The University of Sydney. Participants were recruited through five main strategies in May 2022. First, corresponding authors listed on articles published in the years 2019–21 in four well-known transfusion medicine journals (Transfusion, Vox Sanguinis, Transfusion Medicine, Blood Transfusion) were sent an email invitation to complete the online survey ($n = 1629$). Second, chief investigators who received a grant in the field of transfusion medicine from the Australian Research Council or the Australian and New Zealand Society of Blood Transfusion in the last 5 years (2017–22) and were not already included in the list of corresponding authors were emailed an invitation to complete the online survey ($n = 14$). Third, an invitation to complete the survey was distributed indirectly through public posts using the authors' personal accounts (A.T., B.M., T.D.) on social media platforms Twitter and LinkedIn. Fourth, the study invitation was circulated within the Alliance of Blood Operators by the International Services team at Australian Red Cross Lifeblood. Finally, the snowballing technique was applied by asking survey respondents and those who received the email invitation to forward the survey to other researchers

working in the field of transfusion medicine. A total of 1643 survey invitations were emailed directly to potential participants (corresponding authors and grant recipients) and a reminder email was sent 2 weeks after the initial invitation. Ethical approval to conduct the study was obtained from The University of Sydney (2021/854).

2.2 | Survey instrument

The questionnaire was informed by studies conducted with researchers, policy-makers, and practitioners on KT in other settings.[18–22] It was piloted with three individuals working in transfusion medicine as a researcher or end-user. The pilot data was not included in the main study. Relevant survey measures, including demographic and work-related questions, can be found in the Supplementary Materials.

For the assessment of barriers, facilitators, and supports, the study team created statements based on the findings from a qualitative study exploring health researchers' experiences of practicing KT.[22] Participants were asked to rate their agreement with 15 potential barriers to KT on 5-point Likert scales (1 = strongly disagree, 5 = strongly agree) following the question "What barriers have you faced when translating or attempting to translate your research findings?" The statements were followed by an open-ended question "Are there any other factors that hindered your ability to translate your research?" Facilitators of KT were captured using a multiple-choice question "What factors have you found support the process of translating research findings?," in which participants were able to select up to seven potential facilitators or to select "none of the above." This was followed by an open-ended question: "Are there any other factors that helped you to translate your research?" Supports for practicing KT were assessed using a multiple-choice question "What could be done to better support your engagement in practising research translation?" Participants could select up to five potential supports or the exclusive option "I don't need any support to translate my research." Participants were then asked an open-ended question: "What else could be done to better support you?"

2.3 | Statistical analysis

Statistical analyses were performed using statistical software IBM SPSS (IBM SPSS Statistics 28.0; IBM Corporation). For descriptive analysis, sample characteristics and survey items were summarized by medians (interquartile range) for continuous variables and by percentages for categorical variables. In addition, responses to the 5-point Likert scale barriers items were collapsed into two categories for ease of interpretation in the descriptive analysis: affirmative (strongly agree, agree) or not affirmative (neither agree nor disagree, disagree, strongly disagree).

Univariate means testing was performed to determine differences by participant characteristics reported in facilitators and supports using chi-square goodness-of-fit, and barriers using independent *t*-tests and one-way analysis of variance (ANOVA). Significant effects were followed by post hoc Tukey's HSD tests to determine where significant differences occurred between groups. Participant characteristics examined were career stage, work setting, and research focus. To simplify the research focus and increase group size, the categories, "blood transfusion," "patient blood management," and "transfusion complications" were collapsed into a single category (blood transfusion), and "cellular therapy and tissue banking" and "transfusion-transmitted diseases" was merged with "other." Main work setting was dichotomized as academic (university, research institute) versus applied (remainder). Statistical significance was defined as $p < .05$.

3 | RESULTS

A total of 131 people responded to the survey. However, 20% ($n = 26$) did not complete the relevant survey sections, leaving 105 eligible responses available for analysis. An overview of the characteristics of the 105 study participants is presented in Table 1. The sample consisted almost equally of men (51%) and women (47%). Participants resided in 29 different countries, including Australia, the United States, the Netherlands, Canada, the United Kingdom, Cameroon, Argentina, Saudi Arabia, and South Korea (a detailed overview can be found in Table S1 in the Supplementary Materials). Most worked at a blood collection agency (34%), followed by a hospital setting (25%) or at a university (23%). Participants were quite experienced, with 44% having worked in the area of transfusion medicine for more than 15 years (range 1–50 years). The sample was diverse in their research focus and the type of methods they used in their research. A third (32%) reported having received some form of KT training.

3.1 | Barriers to knowledge translation

Participants were asked about the barriers they faced when translating or attempting to translate their research (see Table 2). The three systemic barriers were the most frequently endorsed: having too many competing priorities, not having the time, and not having sufficient funds

TABLE 1 Participant characteristics ($n = 105$).[a]

Demographic variables	*n* (%)
Gender	
Man/Male	54 (51.4)
Woman/Female	49 (46.7)
Non-binary	1 (1.0)
Prefer not to say	1 (1.0)
Main work setting	
University	24 (22.9)
Research institute	9 (8.6)
Government department or agency	2 (1.9)
Blood collection agency	36 (34.3)
Hospital setting	26 (24.8)
Healthcare service (other)	1 (1.0)
Other	6 (5.7)
Missing	1 (1.0)
Main research focus	
Blood components	18 (17.1)
Blood donation	27 (25.7)
Blood transfusion	30 (28.6)
Immunohematology and blood genomics	11 (10.5)
Other	19 (18.1)
Type of methods (MC)	
Animal studies	10 (9.5)
Biospecimen analysis research	35 (33.3)
Data linkage research	30 (28.6)
Epidemiological research	44 (41.9)
Interventional/clinical trials research	35 (33.3)
Qualitative research	43 (41.0)
Quantitative research	51 (48.6)
Other	5 (4.8)
Career stage	
Years active in transfusion medicine	15 (9–25)
Early (1–5 years)	15 (14.3)
Mid-career (6–15 years)	41 (39.0)
Established (16–50 years)	46 (43.8)
Not specified	3 (2.9)
Knowledge translation training	
Yes	34 (32.4)
No	61 (58.1)
Unsure/Do not know	10 (9.5)

Abbreviation: MC, multiple choice.
[a]Years active in transfusion medicine presented as median (interquartile range).

or resources to translate research. About a third of participants indicated experiencing difficulties translating research because of the current emphasis on training academics to conduct but not translate research, difficulties translating a very large body of evidence, and concerns that their research findings will not be applied or translated correctly. Organizational barriers were reported by a quarter of participants, with the highest-rated barrier in this category being not feeling supported by their organization/institution to translate their research. Further, one in five participants felt they lacked the skills or ability to translate research. On the other hand, fewer participants reported having concerns regarding intellectual property and commercialization. Finally, the three attitudinal barriers were not often endorsed.

Comparative analysis indicated significant differences in perceived barriers by research focus and work setting. First, those focusing on genomics experienced insufficient funds or resources for KT to a greater extent than those working in other areas of transfusion medicine (4.10 ± 0.74 vs. 3.11 ± 0.68, $p = .020$), $F(4, 97) = 3.351$, $p = .013$. Second, those focusing on components experienced the concern that their research findings will not be translated correctly to a greater extent than those in transfusion (3.39 ± 1.09 vs. 2.53 ± 0.86, $p = .037$) or other areas (3.39 ± 1.09 vs. 2.42 ± 0.69, $p = .027$), $F(4, 100) = 3.154$, $p = .017$. Third, those focusing on components experienced the concern regarding intellectual property and commercialization to a greater extent than those in donation (2.94 ± 1.09 vs. 1.93 ± 0.78, $p = .009$) or genomics (2.94 ± 1.09 vs. 1.78 ± 1.09, $p = .037$), $F(4, 91) = 4.163$, $p = .004$. Finally, compared to researchers working in an applied setting, those in an academic setting experienced difficulties translating a large body of evidence to a lesser extent (2.63 ± 1.04 vs. 3.19 ± 0.98), $t(93) = -2.602$, $p = .011$, and felt that translating research is not beneficial for their career to a greater extent (2.30 ± 1.05 vs. 1.84 ± 0.86), $t(101) = 2.358$, $p = .020$. No significant differences were found by career stage.

When asked if there are any other factors that hinder their ability to translate research, some participants commented on the "*gap between research and practice*" and that "*the perception of two silos is probably the biggest barrier*." A few also mentioned experiencing barriers with end-users "*not interested or willing to act on research findings*" and feeling like they have limited power to change policy and practice without the support of management or senior clinicians. However, a few also reported a lack of interest in KT among (senior) researchers who they

TABLE 2 Agreement with barriers faced when translating or attempting to translate research[a].

	n (%)	Median (IQR)
Systemic barriers		
I do not have enough funds or resources to translate my research	53 (50.5)	4 (3–4)
I do not have the time to translate my research	55 (52.4)	4 (3–4)
I have too many competing priorities to translate my research	60 (57.1)	4 (3–4)
Individual barriers		
I am worried that my research findings will not be applied or translated correctly	32 (30.5)	3 (2–4)
I do not have the skills or ability to translate research	20 (19.0)	2 (2–3)
I experienced difficulties translating research because of the current emphasis on training academics to conduct but not translate research	36 (34.3)	3 (2–4)
Organizational barriers		
I do not feel supported by my organization/institution to translate my research	28 (26.7)	3 (2–4)
I do not know who is responsible for translating research	21 (20.0)	2 (2–3)
End-users (e.g., policy-makers, practitioners) do not understand the research	24 (22.9)	3 (2–3)
I do not know how to make contact with end-users (e.g., policy-makers, practitioners)	24 (22.9)	2 (2–3)
Logistical barriers		
I experienced difficulties translating a very large body of evidence	33 (31.4)	3 (2–4)
I have concerns regarding intellectual property and commercialization if I were to (attempt to) translate my research	16 (15.2)	2 (2–3)
Attitudinal barriers		
I do not have any interest in translating research	4 (3.8)	2 (1–2)
Translating research is not relevant to my research	1 (1.0)	2 (1–2)
Translating research is not beneficial for my career	8 (7.6)	2 (1–2)

[a]Rated as Strongly disagree (1) to Strongly agree (5). For frequencies, "Agree" and "Strongly Agree" pooled together as "Agree."

thought believed that "*policy makers should do it themselves*." Participants also felt they lacked experience in working with KT tools and did not know how to engage with end-users to facilitate KT. As one participant commented: "*There are really no organizational structures (guidelines/policies/roles/incentives) to bring different people together to work on research translation in the present context*."

3.2 | Facilitators of knowledge translation

Participants were asked what they found supported the process of translating research findings (see Table 3), with the highest scoring facilitator being maintaining good relationships with end-users. Personal traits, including drive, passion, and enthusiasm, were also rated highly. More than half of the sample indicated end-users valuing research, access to resources such as funding and personnel, experience and training in KT, and working with trained communications personnel as facilitators of KT. Two out of five participants reported having clear roles in translating research as a factor that supports the process of KT. Endorsement of the facilitators did not differ by research focus, career stage, and work setting.

When asked if there are any other factors that help them to translate research, one of the most frequently mentioned factors was ensuring their research aligns with the priorities of end-users and is seen by end-users as relevant to "*everyday problems*." For example, one participant commented, "*Ensuring that the research proposal and plan is driven by needs of patients makes translation more likely*." Participants also commented on the need for support from policy-makers as well as senior researchers and colleagues. Active stakeholder engagement was frequently mentioned, with one participant highlighting that they invested "*a lot of personal effort in learning about the end-user needs and how to communicate in their 'language'*" to facilitate KT. Others indicated that they worked with implementation researchers or created partnerships with specialist KT organizations. Finally, one participant mentioned "*fortunate timing*" as a facilitating factor and having the research ready to be translated when there is organization need.

TABLE 3 Selected facilitators and supports for knowledge translation.

	n (%)
Facilitators	
Maintaining good relationships with end-users (e.g., policy-makers, practitioners)	82 (78.1)
Personal traits including drive, passion, and enthusiasm	65 (61.9)
End-users (e.g., policy-makers, practitioners) valuing research	62 (59.0)
The ability to access resources for research translation such as funding and personnel	59 (56.2)
Experience and training in practicing knowledge translation	56 (53.3)
Trained communications personnel working on or alongside my team	56 (53.3)
Clear roles in translating research	44 (41.9)
None of the above	5 (4.8)
Supports	
Opportunities to collaborate through facilitated networks	72 (68.6)
More protected time to practice knowledge translation	68 (64.8)
Access to resources to increase awareness, promotion, and discussion of knowledge translation	61 (58.1)
Access to education and training	57 (54.3)
Recognition for knowledge translation efforts in promotion and tenure consideration	54 (51.4)
I do not need any support to translate my research	3 (2.9)

3.3 | Supports for practicing knowledge translation

When asked what could be done to better support their engagement in practicing research translation (see Table 3), most participants indicated opportunities to collaborate through facilitated networks. Participants also wanted more protected time to practice KT, access to resources to increase awareness, promotion, and discussion of KT, access to education and training, and recognition for their KT efforts in promotion and tenure consideration. Only a few participants indicated not needing any support to translate their research.

A significant difference was found in the proportion of participants who wanted access to education and training by research focus, $\chi^2(4) = 15.349$, $p = .004$. In particular, fewer researchers in the other category selected this support (26.3%) compared to researchers working in components (88.9%), genomics (63.6%), donation (51.9%), and transfusion (50.0%). No further significant differences were found in supports by research focus, career stage, and work setting.

When asked what else could be done to better support them, a few participants emphasized the need for organizational support and organizational readiness for change. Some suggested having a dedicated KT department, whilst others wanted more training on KT and stakeholder engagement to translate the knowledge themselves. One participant commented on embedding KT in the research process to help clarify what resources, training, and involvement are needed from the outset: "*knowledge translation should be part of the whole research process from research proposal to study phase, reporting and other forms implementation.*"

4 | DISCUSSION

In order to provide optimal care to blood donors and blood recipients, it is crucial that knowledge gained from research is translated into policy and practice. This study is the first to our knowledge to investigate experiences of KT among researchers working in transfusion medicine. We identified barriers faced by researchers when translating or attempting to translate their research as well as exploring factors that have helped to facilitate KT and the supports needed to practice KT. Researchers working in different areas of transfusion medicine and at varying stages in their careers were relatively similar in their KT experiences indicating that many of our findings relate to the broader area of transfusion medicine.

The highest-rated barriers to KT related to systemic issues such as having too many competing priorities, lack of funding or resources or not having the time to translate research. These issues have also been identified by researchers working in areas outside of transfusion medicine.[3,22,23] The selected supports reflect this need, with two of the highest-rated supports by our participants relating to more protected time and resources for KT. A recent survey found that protected time and a dedicated KT practitioner or team are perceived as the most effective strategies to support KT in pediatric health centers and research institutes.[24] Organizations can help facilitate KT by building capacity for researchers to engage in KT. One potential approach is to encourage researchers to develop a KT plan as part of their grant or project proposals to ensure dedicated funding, resources, and time for KT activities. Further, research funders or regulatory agencies can further facilitate KT by monitoring implementation outcomes, dissemination of knowledge, and advocating the importance of KT.[26]

Maintaining good relationships with end-users was seen as essential by researchers to support the process of KT. However, almost a quarter of our participants expressed difficulties in contacting end-users or felt that end-users did not understand their research, with similar experiences reported across research focus area, career stage, and work setting. Further, some researchers reported a disconnect between research and practice, and perceived a lack of interest in research among end-users. This finding aligns with the experiences of researchers working outside of transfusion medicine who have expressed difficulties engaging policy-makers in their research without an existing relationship.[23] This is an important issue as end-user engagement throughout the research process has been found to improve implementation outcomes.[27–29] Organizations can address this issue by establishing networks between researchers and end-users, by providing stakeholder engagement training to researchers, by upskilling end-users in research, and by encouraging or incentivizing the involvement of end-users in grant or research proposals.[4,5] On the other hand, researchers can look to existing frameworks to assist with end-user engagement, such as integrated KT.[25,30] By facilitating end-user engagement, the likelihood will increase that the knowledge produced is useful, usable, and therefore more likely to be translated.[30]

A lack of support from their organization or institution to translate research was a key organizational barrier reported by researchers. Further, many researchers reported that they lacked the time to translate their research or felt they had too many competing priorities. Organizations can support researchers in their KT efforts by providing resources or structures to enable research evidence to become more accessible to end-users such as a database of plain English summaries or journal subscriptions.[4,5] In addition, they can establish dedicated roles that facilitate research use, such as "knowledge brokers," to connect researchers and end-users, and provide expertise in KT strategies.[4,31,32] Further, organizations can provide training to build researchers' KT capabilities as more than half of our sample wanted access to education and training. Organizations can also embed the value of research in their mission, vision, values, and strategic plan to further emphasize their support for KT.[4] Studies have shown that having tools, resources, and systems to support research use in place is associated with greater use of research in policy and practice.[4,33–36]

Opportunities to collaborate through facilitated networks were the most frequently selected support for KT desired by participants. Blood collection agencies and affiliated organizations can set up networks or use existing networks to connect researchers and end-users to facilitate the interaction between research and policy and practice.[4,5] Further, conference organizers could organize working groups where attendees can share their KT experiences. In addition, journal editors could put out a call for papers or even a special issue about KT in transfusion medicine to facilitate this exchange of knowledge.

The main strength of this study is the international perspective on KT in transfusion medicine it provides, as our survey was completed by people from a broad range of countries. However, there are a number of limitations. First, participants included in the sample were likely those interested in or with experience of KT. Our study invitations clearly indicated our research topic and researchers who did not perceive KT as relevant to their work or have any interest in KT may have opted out of participating. Further, the topic may have influenced the decision to stop completing the survey as some participants stopped after answering the demographic section. Second, our sample was relatively small considering the number of email invitations sent, the likely visibility of our social media posting, and potential forwarding of study invitations to colleagues. However, the sample was diverse in terms of participants' locations, sex, research focus, career stage, and research methods used. Finally, the presentation of more barriers than facilitators as well as barriers being presented before facilitators may have prompted participants to engage in more cognitive elaboration about barriers than facilitators.

This study provides insights into researchers' experiences of translating the knowledge gained from their research, and highlights strategies that can be used to facilitate KT in transfusion medicine. Few differences were found between research focus area, work setting, and career stage, indicating that our findings are reflective of the broader area of transfusion medicine. Ensuring appropriate support for researchers in KT will ensure that blood donors, blood recipients, blood collection agencies, and the broader community can optimally benefit from current evidence.

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CONFLICT OF INTEREST STATEMENT

The authors have disclosed no conflicts of interest.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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KT Questionnaire

Demographic and professional characteristics
These first set of questions will ask about your demographic and professional background.

In which country are you based? _____

How do you describe your gender?
- Man/Male
- Woman/Female
- Non-binary
- I use a different term
- Prefer not to say

Which best describes the setting in which you work?
- University
- Research institute (not within a university)
- Government department or agency
- Blood collection agency
- Hospital setting
- Healthcare service (not a blood collection agency or hospital)
- Other

Please specify other work setting: _____

Which best describes your main research focus?
- Blood components
- Blood donation
- Blood transfusion
- Cellular therapy and tissue banking
- Immunohematology and blood genomics
- Patient blood management
- Transfusion complications
- Transfusion-transmitted diseases
- I do not conduct research
- Other

What type of research are you currently using? Please select all that apply:
- Animal studies
- Biospecimen analysis research
- Data linkage research
- Epidemiological research
- Interventional/Clinical trials research
- Qualitative research
- Quantitative research
- I do not conduct research
- Other

How many years have you worked within the area of transfusion medicine? _____

Have you ever received training on translating research into policy and/or practice (i.e. knowledge translation)?
- Yes
- No
- Unsure/Don't know

Barriers to research translation

For the next set of questions, we would like to know more about some of the barriers you may face when translating or attempting to translate your research.

What barriers have you faced when translating your research findings? Please rate your agreement with the following statements:

I don't have enough funds or resources to translate my research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I don't feel supported by my organisation/institution to translate my research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I don't have the time to translate my research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I have too many competing priorities to translate my research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I don't know how to make contact with end-users (e.g., policy-makers, practitioners)
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I am worried that my research findings will not be applied or translated correctly
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I don't have the skills or ability to translate research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I don't have any interest in translating research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

Translating research is not relevant to my research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

Translating research is not beneficial for my career
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I don't know who is responsible for translating research.
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I experienced difficulties translating a very large body of evidence
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I experienced difficulties translating research because of the current emphasis on training academics to conduct but not translate research

o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

I have concerns regarding intellectual property and commercialisation if I were to (attempt to) translate my research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

End-users (e.g., policy-makers, practitioners) do not understand the research
o Strongly agree o Agree o Neither agree nor disagree o Disagree o Strongly disagree
o N/A

Are there any other factors that hindered your ability to translate your research?

_____

Facilitators of research translation
We would like to know more about some of the facilitators that have supported your translation practices.

What factors have you found support the process of translating research findings? Please select all that apply:

- ☐ Maintaining good relationships with end-users (e.g., policy-makers, practitioners)
- ☐ Clear roles in translating research
- ☐ The ability to access resources for research translation such as funding and personnel
- ☐ Experience and training in practising knowledge translation
- ☐ Personal traits including drive, passion and enthusiasm
- ☐ Trained communications personnel working on or alongside my team
- ☐ End-users (e.g., policy-makers, practitioners) valuing research
- ☐ None of the above

Are there any other factors that helped to translate your research?

_____

What could be done to better support your engagement in practising research translation? Please select all that apply:

- ☐ Access to education and training
- ☐ Access to resources to increase awareness, promotion and discussion of knowledge translation
- ☐ Opportunities to collaborate through facilitated networks
- ☐ Recognition for knowledge translation efforts in promotion and tenure consideration
- ☐ More protected time to practice knowledge translation
- ☐ I don't need any support to translate my research

What else could be done to better support you?

_____

Innovative knowledge translation strategies
We would like to learn more about how research translation can be improved in transfusion medicine.

Please describe one of the innovative ways your organisation uses or shares knowledge about research:

_____

Country

Table S1 Participant location (country)

Country	n	%
Argentina	1	1%
Australia	18	17%
Belgium	1	1%
Cameroon	1	1%
Canada	7	7%
China	1	1%
Croatia	1	1%
Czech Republic	1	1%
Finland	2	2%
France	2	2%
Germany	2	2%
Ghana	1	1%
Ireland	3	3%
Italy	3	3%
Japan	1	1%
Lebanon	1	1%
New Zealand	1	1%
Norway	1	1%
Qatar	1	1%
Saudi Arabia	2	2%
South Korea	2	2%
Spain	1	1%
Sweden	1	1%
Switzerland	1	1%
The Netherlands	8	8%
Trinidad and Tobago	1	1%
Turkey	1	1%
United Kingdom	4	4%
United States of America	10	10%
Not reported	25	24%
Total	**105**	**100%**

Chapter Four

Researchers' views on and practices of knowledge translation: an international survey of transfusion medicine researchers

Preface

4.1 Chapter overview

This chapter consists of a published manuscript entitled "*Researchers' views on and practices of knowledge translation: an international survey of transfusion medicine researchers*", which is the second paper reporting on the findings from Study 2.

In this paper, I conducted an online survey with researchers working in transfusion medicine to determine their views on and practices of knowledge translation. Specifically, I investigated a) researchers' views of and attitudes to knowledge translation, b) how researchers share their knowledge (i.e. dissemination activities), and c) how they typically engage end-users in their research. This study provides insights into how researchers currently practice knowledge translation and will help to identify opportunities to further strengthen knowledge translation in transfusion medicine. As this paper uses completed responses from an earlier section of the survey, the sample size is slightly larger than the one reported in Chapter 3 due to attrition.

4.2 Publication details

This chapter has been published in *Implementation Science Communications*, a leading journal in the field of knowledge translation:

> **Thijsen A**, Masser B, Davison TE, Williamson A. Researchers' views on and practices of knowledge translation: an international survey of transfusion medicine researchers. *Implementation Science Communications*. 2024; 5(1): 9. https://doi.org/10.1186/s43058-024-00546-3

The article includes the following supplementary materials:

- STROBE Statement
- Included survey measures

4.3 Dissemination details

The work included in this chapter has been presented at the following conference:

> **Thijsen A**, Williamson A, Masser B, Davison TE. Examining knowledge translation practice among researchers working in transfusion medicine: a cross-sectional, international survey study. *NHMRC Research Translation Long Weekend 2022*. Sydney, Australia (hybrid). November 17-22, 2022.

4.4 Authors' contributions

AT designed the study, coordinated ethics approval and data collection, analysed the data, and drafted the manuscript. BM and TED assisted with the data collection. AW, BM, and TED provided guidance in terms of the study design and manuscript preparation.

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Implementation Science Communications

RESEARCH Open Access

Researchers' views on and practices of knowledge translation: an international survey of transfusion medicine researchers

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Abstract

Background Health research is often driven by the desire to improve the care and health of the community; however, the translation of research evidence into policy and practice is not guaranteed. Knowledge translation (KT) activities, such as dissemination and end-user engagement by researchers, are important to achieving this goal. This study examined researchers' views on and practices of KT in the field of transfusion medicine.

Methods An anonymous, cross-sectional survey was distributed to transfusion medicine researchers in May 2022 by emailing corresponding authors of papers in four major blood journals, emailing grant recipients, posting on social media, and through international blood operator networks. Comparative analyses were conducted for career stage, work setting, research type, and KT training.

Results The final sample included 117 researchers from 33 countries. Most participants reported that research translation was important (86%) and felt it was their responsibility (69%). Fewer than half felt they had the skills to translate their research (45%) or knew which strategies to employ (45%). When examining how research findings are shared, most reported using diffusion activities (86%), including publishing in peer-reviewed journals (74%), or presenting at academic conferences (72%). Fewer used dissemination methods (60%), such as developing educational materials (29%) or writing plain language summaries (30%). Greater use of tailored dissemination strategies was seen among researchers with KT training, whilst traditional diffusion strategies were used more by those working in an academic setting. Most participants had engaged end-users in their research (72%), primarily to consult on a research component (47%) or to involve them in the research process (45%). End-user engagement was greater among researchers with established careers, working in both academic and applied settings, and with KT training.

Conclusions Whilst participating researchers acknowledged the importance of KT, they typically focused on traditional diffusion strategies. This is despite well-established knowledge of the limited impact of these strategies in achieving KT. Those with KT training were more likely to use tailored dissemination strategies and engage end-users in their research. This demonstrates the value of sharing knowledge from the KT field with health researchers to facilitate KT.

Keywords Knowledge translation, Researchers, Transfusion medicine, Blood, End-user engagement, Dissemination, Diffusion, Implementation science, Knowledge mobilisation

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Contributions to the literature

- This study showed that whilst researchers feel responsible for knowledge translation (KT), many do not feel they have the skills or knowledge to effectively translate their research.
- Traditional diffusion strategies remain the most common ways to share research knowledge in transfusion medicine.
- The findings of this paper showed differences in KT practices by career stage, work setting, and self-reported KT training
- This indicates the potential for KT training to increase the use of tailored dissemination strategies and end-user engagement among researchers.

Background

Offering the best possible care, improving the lives of the community, and contributing to the broader scientific knowledge are some of the key motivators for conducting health-related research [1, 2]. Ensuring knowledge gained from research is appropriately disseminated and/or translated is vital to achieving this goal. This process is often labelled as knowledge translation (KT) and is defined as "the dynamic and iterative process that includes the synthesis, dissemination, exchange, and ethically sound application of knowledge to improve health, provide more effective health services and products, and strengthen the healthcare system" (p.4) [3]. Knowledge producers, such as researchers, play a central role in this process. They can influence the dissemination of knowledge through how the findings are presented and communicated and through the selection of target audiences [4, 5]. Researchers can apply passive and untargeted strategies, such as publishing in peer-reviewed journals, mass mailings, or conference presentations. They can also apply more active and tailored strategies, such as plain language summaries, patient decision support aids, and interactive small group meetings with end-users [6–8].

Whilst these dissemination strategies are necessary to spread information, they are not sufficient to ensure actual use of knowledge [5, 9]. Therefore, in addition to disseminating research findings, researchers are encouraged to involve research end-users, such as policymakers and practitioners, throughout the entire research process. The goal of end-user engagement is to increase the relevance of the research as well as to improve the accessibility, appropriateness, and understandability of the research evidence [5, 10]. In order to achieve these goals, it is important to establish meaningful and active collaborations between researchers and end-users in determining research priorities, conducting the research, interpreting outcomes, and translating findings into policy and practice [10, 11]. An essential step in minimising the knowledge-to-practice gap is gaining an understanding of how researchers disseminate and engage end-users in their research.

A number of studies have investigated how researchers facilitate the KT process through dissemination and end-user engagement. A survey [12] conducted in 2001 among health researchers in Alberta, Canada, tried to provide objective measures of passive strategies—by summing the number of publications in the last five years—and active strategies—by summing the number of plain language reports and the number of times they involved end-users in their research. The authors found that researchers reported more passive than active dissemination of their research, with this particularly evident among basic science researchers. Similar findings have emerged in other surveys of researchers working in health-related fields, with more reporting using mostly passive diffusion strategies, including academic journals (88–99%) and academic conferences (90–93%) than active tailored approaches, such as plain language summaries (33–64%) and face-to-face meetings (48–68%) [13–16]. A 2012 survey study found that only one-third of US-based health researchers involved end-users in their research [17]. Consistent with this, a more recent international survey found that involving end-users was the least employed KT strategy of authors of public health trial publications [15]. A more in-depth exploration [11] showed that health researchers in Canada mostly engaged end-users in their research by informing them about their findings or by getting their feedback on certain aspects of the research. Only a few actively collaborated with end-users throughout the research process. The authors also reported that researchers believed that some basic and biomedical research areas were not appropriate for engagement throughout the research process with end-users such as patients and the public.

These results highlight the knowledge-to-practice gap that the field of KT faces. Studies have shown that the effective use of KT activities is associated with a greater impact of the research on public health policy and practice [15, 18]. In particular, disseminating study findings and providing training to end-users on how to use the intervention have been identified as the most effective KT strategies in ensuring the translation of trial findings [15]. Despite the importance of dissemination and end-user engagement activities, there is a lack of understanding of whether these activities are influenced by certain characteristics of the knowledge being produced and the person conducting the research, such as the career stage of the researcher, the setting in which the researcher is

based, the type of research conducted, and whether the researcher has been trained on KT. Whilst it has been suggested that these characteristics can influence KT activities [19, 20], this has not been thoroughly investigated to our knowledge. This is an important knowledge gap as understanding these factors can help future efforts to improve KT.

The aim of this international survey study is to examine researchers' views on and practices of two aspects of KT (dissemination and exchange) in the field of transfusion medicine. This is a multidisciplinary field focusing on the collection, storage, and use of blood and blood-related products [21, 22]. Transfusion medicine includes basic science research, such as investigations into reducing viral transmission of blood products, treatment methods using blood-related products, and optimal storage solutions of blood and blood components. It also includes applied science research, which focuses on blood donor management such as increasing blood donor recruitment and retention and reducing adverse events in relation to the collection of blood [22, 23]. Research conducted in this area is driven by gaps in knowledge and operational needs. Researchers can be based in an applied setting, such as a blood collection agency or a hospital, and/or an academic setting, such as a university or research institute [22]. A recent review of the published literature showed that, whilst there is some evidence of KT practices in transfusion medicine, it is in the early stages [24]. Further, researchers in this field are faced with similar KT barriers as others, such as lack of time, funding, and/or resources. They also perceive maintaining good relationships with end-users as critical to the KT process [25]. We extend these findings by examining researchers' KT activities in the area of transfusion medicine. Specifically, our study objectives were to examine (1) transfusion medicine researchers' views of and attitudes towards KT, (2) their knowledge dissemination activities, and (3) their end-user engagement activities. We examined the differences by career stage, work setting, research type, and KT training. Documenting these views and activities by researchers is important to gain an understanding of how to minimise the knowledge-to-practice gap in transfusion medicine.

Methods

This paper presents a component of a larger cross-sectional survey study on KT in transfusion medicine that was conducted with an international cohort of researchers. Data were collected and managed using REDCap electronic data capture tools hosted at the University of Sydney. Participants were recruited through five main strategies using a combination of direct emails to corresponding authors of published articles in well-known transfusion medicine journals and grant recipients of research relating to transfusion medicine ($n=1645$), distribution via an international blood operator network, and public social media posts in May 2022, with details published elsewhere [25]. Participants were excluded from participating in the study if they indicated in the screening question that they did not spend any of their working time on research activities. Ethical approval to conduct the study was obtained from the University of Sydney (#2021/854). The STROBE Checklist [26] was used to guide our reporting (see Additional file 1).

Survey instrument

The questionnaire was developed using existing literature on KT activities and end-user research engagement [6, 11, 27, 28]. Feedback was sought on the wording of the questions and survey flow from three individuals working in transfusion medicine as a researcher or medical officer.

The questionnaire consisted of several sections. First, participants were asked a range of demographic and work-related questions including gender, country currently based, primary and secondary work setting, current type of research methodology being used, years active in transfusion medicine, and whether they have ever received training on KT. The second part focused on dissemination activities whereby participants were asked "To what extent do you do the following activities to disseminate your research findings?", rating 11 activities on a 5-point Likert scale (1 = never, 5 = always). The list of dissemination activities was informed by Lomas' taxonomy [6] and the Guide to Knowledge Translation Planning at CIHR [27]. The third part of the questionnaire focused on end-user engagement activities informed by Crockett et al. [11] and included multiple-choice questions on the level of end-user engagement in general ("At what level have you engaged end-users in your research?"), identifying which end-user groups they have ever involved in their research ("Who have you engaged in the research process?"), and at what research stage ("Please indicate those research phases where you have experience engaging with end-users."). The final part of the survey elicited participants' views about who should be responsible for and the importance of KT using 12 statements informed by Lynch et al. [28] that participants responded to on 5-point Likert scales (1 = strongly disagree, 5 = strongly agree). Survey questions are available in Additional file 2.

Statistical analysis

For descriptive analyses, adopting the approach taken by Lynch et al. [28], responses to the statements on the importance of KT on 5-point Likert scales were collapsed into three categories as affirmative (strongly agree, agree), neutral (neutral), and not affirmative (disagree, strongly

disagree). Similarly, responses to diffusion and dissemination activities given on 5-point Likert scales were categorised as never, rarely/occasionally, and frequently/always for ease of interpretation. In addition, end-user groups were combined as blood donors/recipients (blood donors, blood recipients), front-line staff (blood collection staff, blood processing staff, hospital staff), senior management/policymakers, general public, and others.

For comparative analyses, responses to primary and secondary work settings were collapsed to create a new variable "work setting", with the categories "academic" (university and/or research institute), "applied" (government department/agency, blood collection agency, hospital setting, and/or other healthcare service), and "joint" (university/research institute and government department/blood collection agency/hospital setting/other healthcare service). Further, participants' "research type" was derived from data on research methods with the categories "basic science" (animal studies and/or biospecimen analysis research) and "applied science" (all remaining categories). The career stage was derived from years active in transfusion medicine, with the categories "early/mid-career" (1–15 years) and "established career" (16 years and over). Finally, "KT training" was dichotomised as yes or no, with no comprising responses of "no" and "don't know/unsure".

Sample characteristics and responses to survey items are described using medians (interquartile range) and means (standard deviation) for continuous variables and by frequencies (percentages) for categorical variables. Differences between career stage, work setting, research type, and KT training were investigated using independent *t*-tests, chi-squared tests, and one-way analysis of variance, with significant effects further investigated using Tukey's HSD tests. All analyses were performed using statistical software (IBM SPSS Statistics 28.0; IBM Corporation) with statistical significance defined as $p < 0.05$.

Results

A total of 131 people responded to the survey. However, 10% ($n = 13$) did not complete the relevant survey sections, and one participant indicated not conducting research, leaving 117 eligible responses available for analysis. Table 1 shows the characteristics of the final sample. Participants were diverse in gender, with approximately equal numbers of men and women, and diverse in their work setting, with 41% indicating working in two different settings. When combining the two types of work settings, 23% worked solely in an academic setting, 48% worked solely in an applied setting, and 28% worked in a joint setting. Participants also used a wide variety of research methods, with 33% using at least one basic science method. Further, participants were quite experienced, with 43% having worked in the area of transfusion medicine for more than 15 years (range 1–50 years). The sample included participants from 33 countries, including Australia, the USA, the Netherlands, Canada, the UK, Cameroon, Argentina, Saudi Arabia, and South Korea.

Table 1 Participant characteristics ($n = 117$)[a]

Variables	*n* (%)
Gender	
Man/male	58 (49.6)
Woman/female	57 (48.7)
Non-binary	1 (0.9)
Prefer not to say	1 (0.9)
Main work setting	
University	28 (23.9)
Research institute	11 (9.4)
Government department or agency	2 (1.7)
Blood collection agency	36 (30.8)
Hospital setting	32 (27.4)
Healthcare service (other)	1 (0.9)
Other	6 (5.1)
Missing	1 (0.9)
Secondary work setting	
University	24 (20.5)
Research institute	2 (1.7)
Government department or agency	7 (6.0)
Blood collection agency	7 (6.0)
Hospital setting	8 (6.8)
None	65 (55.6)
Missing	4 (3.4)
Type of methods (MC)	
Animal studies	11 (9.4)
Biospecimen analysis research	39 (33.3)
Data linkage research	33 (28.2)
Epidemiological research	48 (41.0)
Interventional/clinical trials research	39 (33.3)
Qualitative research	46 (39.3)
Quantitative research	53 (45.3)
Other	17 (14.5)
Career stage	
Years active in transfusion medicine	16.6 (± 10.5)
Early to mid-career (1–15 years)	63 (53.8)
Established (16–50 years)	50 (42.7)
Not specified	4 (3.4)
Knowledge translation training	
Yes	37 (31.6)
No	69 (59.0)
Unsure/do not know	11 (9.4)

[a] Years active in transfusion medicine presented as mean (standard deviation)

MC multiple choice

Importance, ability, and responsibility for knowledge translation

Researchers' views on the importance of and responsibility for KT are presented in Table 2. Most participants felt that translating their research is important, and only a few reported that their research is not the sort that can be translated. KT was seen by most participants as the responsibility of clinicians (70%), with fewer attributing KT's responsibility to researchers (58%). When cross-tabulating these two items, half of the sample (51%) indicated that both clinicians and researchers are responsible for KT, with one quarter reporting it was the responsibility of clinicians only (23%), and smaller numbers indicating KT is the responsibility of researchers only (10%), or neither agreeing nor disagreeing with both statements (16%). However, when asked about their own role, two-thirds of participants felt it was their responsibility to translate their research, with only a few transferring this responsibility to someone else in their team. Despite this sense of responsibility, a third of the participants felt that spending time on KT would take them away from their research. Less than half of the sample reported knowing which strategies to use or felt that they had the skills to translate their research. When looking at KT supports, only a small proportion of the sample reported that adequate funding was available to support KT. Further, most participants agreed that specialised implementation researchers should translate their research and that every research team should include such a researcher.

Significant differences were found in perceived importance, ability, and responsibility for KT by career stage, research type, work setting, and KT training. Participants differed in their perceived ability to engage in KT, with more experienced researchers reporting knowing which strategies to use (3.58 ± 0.77 vs. 3.03 ± 1.03, $t(104) = -3.07$, $p = 0.003$) and having the skills to ensure research is translated (3.47 ± 0.75 vs. 3.07 ± 1.09, $t(100.44) = -2.22$, $p = 0.029$), to a greater extent than less experienced researchers. In addition, researchers with KT training reported significantly greater scores on knowledge of KT strategies (3.72 ± 0.70 vs. 3.05 ± 0.98, $t(92.72) = 4.10$, $p < 0.001$), and perceived KT skills (3.58 ± 0.73 vs. 3.05 ± 1.01, $t(107) = 2.79$, $p = 0.006$), than researchers not reporting any KT training. Further, basic science researchers reported greater KT skills than applied science researchers (3.51 ± 0.80 vs. 3.12 ± 1.02, $t(103) = 2.05$, $p = 0.043$). A significant difference was found in clinician responsibility of KT by work setting, $F(2,106) = 3.10$, $p = 0.049$, with researchers working in a joint work setting more likely to report KT as the responsibility of clinicians than researchers in an academic work setting (4.06 ± 0.72 vs. 3.56 ± 0.65, $p = 0.039$) and researchers working an applied setting not being significantly different from other groups (3.88 ± 0.83, both p's > 0.05). Finally, more experienced researchers reported greater funding to support KT than less experienced researchers (2.60 ± 0.96 vs. 2.09 ± 0.81, $t(92.15) = -2.95$, $p = 0.004$).

Dissemination activities

Examining how research findings are shared (see Table 3), most researchers used diffusion activities "frequently" or "always" (86%), with most publishing in peer-reviewed journals and presenting at academic conferences. Researchers reported using more active dissemination activities to a slightly lesser extent (60%), with the most frequently used methods being plain language

Table 2 Researchers' views on the importance and responsibility of knowledge translation ($n = 117$)[a]

Statement	Median (IQR)	Level of agreement, *n* (%)			
		Disagree	Neutral	Agree	*Missing*
1. It is important to me that my research is translated	5 (4–5)	0	11 (9.4)	100 (85.5)	6 *(5.1)*
2. My research is not the sort of research that can be translated	2 (1–2)	97 (82.9)	10 (8.5)	4 (3.4)	*6 (5.1)*
3. It is my responsibility to ensure that my research is translated	4 (3–4)	10 (8.5)	19 (16.2)	81 (69.2)	*7 (6.0)*
4. Research translation is the responsibility of someone else in my team	3 (2–3)	53 (45.3)	43 (36.8)	13 (11.1)	*8 (6.8)*
5. Researchers should be responsible for translating research findings into practice	4 (3–4)	10 (8.5)	33 (28.2)	68 (58.1)	*6 (5.1)*
6. Clinicians should be responsible for translating findings into clinical practice	4 (3–4)	5 (4.3)	23 (19.7)	82 (70.1)	*7 (6.0)*
7. I know which strategies should be used (by myself/others) to translate my research	3 (3–4)	26 (22.2)	31 (26.5)	53 (45.3)	7 *(6.8)*
8. I have the skills to ensure my research is translated	3 (3–4)	25 (21.4)	31 (26.5)	53 (45.3)	*8 (6.8)*
9. There is adequate funding to support translation of research	2 (2–3)	71 (60.7)	26 (22.2)	12 (10.3)	*8 (6.8)*
10. Spending time on translating my research would take me away from research (or other work-related activities) I enjoy	3 (2–4)	44 (37.6)	27 (23.1)	37 (31.6)	*9 (7.7)*
11. Researchers with experience/interest in implementation should translate my research	4 (3–4)	6 (5.1)	29 (24.8)	75 (64.1)	*7 (6.0)*
12. Every research team should include a researcher with expertise in implementation	4 (3–4)	11 (9.4)	25 (21.4)	75 (64.1)	*6 (5.1)*

[a] Rated as strongly disagree (1) to strongly agree (5). For frequencies, "agree", "strongly agree", "disagree", and "strongly disagree" pooled together

Table 3 Diffusion and dissemination activities ($n=117$)[a]

Activities to disseminate research findings	Median (IQR)	Level of engagement, *n* (%)			
		Never	Rarely/occasionally	Frequently/always	*Missing*
Diffusion activities					
Publishing in peer-reviewed journals	4 (3–5)	3 (2.6)	28 (23.9)	86 (73.5)	–
Presenting at an academic conference	4 (3–5)	2 (1.7)	31 (26.5)	84 (71.8)	–
Detailed research reports	3 (2–4)	12 (10.3)	53 (45.3)	50 (42.7)	*2 (1.7)*
Dissemination activities					
Developing new educational materials	3 (2–4)	12 (10.3)	70 (59.8)	34 (29.1)	*1 (0.9)*
Writing plain language summaries	3 (2–4)	10 (8.5)	71 (60.7)	35 (29.9)	*1 (0.9)*
Organising an interactive small group meeting/workshop	3 (2–4)	13 (11.1)	71 (60.7)	32 (27.4)	*1 (0.9)*
Preparing a policy or an evidence brief and disseminating it to relevant audiences (e.g. policymakers, health service providers, or administrators)	3 (2–3)	12 (10.3)	83 (70.9)	21 (17.9)	*1 (0.9)*
Creating networks or networking with end-users such as policymakers and practitioners (e.g. give presentations to relevant networks)	3 (2–3)	24 (20.5)	75 (64.1)	18 (15.4)	–
Engage champions or opinion leaders (e.g. directors, managers) to assist with sharing of research findings	2 (2–3)	19 (16.2)	78 (66.7)	20 (17.1)	–
Engaging with social media (e.g. Facebook, Twitter)	2 (1–3)	35 (29.9)	61 (52.1)	20 (17.1)	*1 (0.9)*
Organising a media release/outreach campaign	2 (1–3)	48 (41.0)	57 (48.7)	8 (6.8)	*4 (3.4)*

[a] Rated as never (1) to always (5). For frequencies, "frequently" and "always", and "rarely" and "occasionally" were pooled together

summaries, new educational materials, or interactive small group meetings/workshops.

Comparative analysis showed significant differences in dissemination activities by experience, work setting, and KT training, but not research type. More experienced researchers reported using detailed reports (3.46 ± 0.99 vs. 3.02 ± 1.27, $t(109) = -2.01$, $p = 0.047$) and developing new education materials (3.20 ± 0.86 vs. 2.76 ± 1.07, $t(110) = -2.38$, $p = 0.019$), to a greater extent than less experienced researchers. A significant difference was found in publishing in peer-reviewed journals by work setting, $F(2,71.55) = 27.13$, $p < 0.001$, with researchers working in an academic setting (4.78 ± 0.42) reporting using this more frequently than those working in a joint work setting (4.27 ± 0.76) or an applied work setting (3.54 ± 1.13), all p's < 0.05. Further, a significant difference was found in academic conference presentations by work setting, $F(2,70.28) = 7.80$, $p < 0.001$, with researchers working in applied work settings (3.57 ± 1.01) reporting using this method of dissemination less frequently than those working in an academic setting (4.26 ± 0.59, $p < 0.001$) or a joint work setting (4.09 ± 0.77, $p = 0.020$). However, no significant difference in dissemination through presentation at academic conferences was observed between researchers working in academic and joint settings ($p = 0.606$).

Several significant differences were observed in the use of dissemination activities between those who received KT training and those who did not. In particular, researchers reporting KT training more frequently developed new educational materials/sessions (3.31 ± 0.79 vs. 2.76 ± 1.05, $t(114) = 2.78$, $p = 0.006$), prepared a policy or evidence brief (3.03 ± 0.73 vs. 2.62 ± 0.96, $t(91.35) = 2.52$, $p = 0.013$), organised an interactive small group meeting/workshop (3.14 ± 0.76 vs. 2.76 ± 1.02, $t(88.83) = 2.20$, $p = 0.030$), organised a media campaign (2.36 ± 0.87 vs. 1.70 ± 0.92, $t(111) = 3.62$, $p < 0.001$), networked with end-users (2.86 ± 0.92 vs. 2.38 ± 1.06, $t(115) = 2.42$, $p = 0.017$), and engaged champions to share research findings (2.97 ± 0.87 vs. 2.31 ± 0.99, $t(115) = 3.49$, $p < 0.001$).

Level of end-user engagement

Table 4 shows the self-reported level of end-user engagement. Most participants had engaged end-users in their research (87%). Participants reported that their engagement with end-users was mainly centred around informing them about findings through presentations, meetings, plain language summaries, or research papers, although 72% reported engaging end-users in their research beyond these activities. Almost half of the participants had consulted end-users about a research component or involved them directly throughout the research process. A quarter of participants reported having partnered with end-users in each aspect of the research. A small proportion of participants reported conducting end-user-initiated research.

Significant differences were found in end-user engagement by career stage, work setting, and KT training. In

Table 4 Level of end-user engagement ($n=117$)

Level of engagement	*n* (%)
Letting them know about your research findings	70 (62.5)
Sent them my research papers	34 (30.4)
Sent them evidence briefs or plain language summaries	38 (33.9)
Presented my research to them	49 (43.8)
Held meetings, roundtables, or forums to discuss my research	41 (36.6)
Obtaining their feedback or input in any component of research	53 (47.3)
Working directly with end-users throughout the research process to ensure that concerns and aspirations are consistently understood and considered to the maximum extent possible	50 (44.6)
Partnering with end-users (i.e. shared decision-making) in each aspect of the research process	31 (27.7)
End-user-initiated research	19 (17.0)
I have not engaged end-users in my research	15 (13.4)

Table 5 Engagement phase ($n=84$)[a]

Research phase	*n* (%)
End-user groups	
Blood donors/recipients	49 (58.3)
Front-line staff	67 (79.8)
Senior management/policymakers	66 (78.6)
General public	19 (22.6)
Other	9 (10.7)
Research phase	
Research priority-setting	40 (47.6)
Grant proposal/protocol writing	42 (50.0)
Input into methodology/study design	47 (56.0)
Development of research questions	45 (53.6)
Data collection	57 (67.9)
Data analysis	23 (27.4)
Interpretation of results	37 (44.0)
Input into the selection of research translation products	27 (32.1)
Evaluation of research processes	19 (22.6)
Determining future research priorities stemming from results	47 (56.0)

[a] Asked only to those who indicated engaging end-users in their research. Multiple choice

particular, a greater proportion of established career researchers engaged end-users in their research beyond dissemination compared to early/mid-career researchers (82% vs. 65%, $\chi^2(1)=4.01$, $p=0.045$), with significant differences also found between researchers in a joint work setting (88%) compared to an applied work setting (71%) or an academic work setting (52%, $\chi^2(2)=12.33$, $p=0.002$), and between researchers with KT training (86%) compared to those without (65%, $\chi^2(1)=5.77$, $p=0.016$). Further, a greater proportion of researchers working in a joint work setting (55%) reported partnering with end-users compared to an academic work setting (30%) or an applied work setting (8.9%, $\chi^2(2)=22.22$, $p<0.001$). In addition, a significant difference in partnering with end users was also found in researchers with KT training (41%) compared to those without (21%, $\chi^2(1)=4.74$, $p=0.030$). Finally, a greater proportion of researchers in an academic work setting (33%) reported not engaging end-users in their research compared to researchers in applied work settings (11%) or joint work settings (3.0%, $\chi^2(2)=12.33$, $p=0.002$). No significant differences in end-user engagement were found by research type.

Specific end-user groups and research stages

Follow-up questions were asked of those who reported engaging end-users in their research ($n=84$) to determine which end-user groups they engaged and at what stage in the research process (see Table 5). The most common groups involved in research were frontline staff (80%) and senior management/policy-makers (79%), followed by blood donors/recipients (58%) and the general public (23%). Participants reported having experience engaging end-users throughout all of the research phases, with the most frequently reported phase being data collection (68%), followed by input into the study design and determining future research priorities stemming from results (both 56%). The least reported phases were data analysis (27%) and evaluation of research processes (23%).

Discussion

Translating research is seen as important by transfusion medicine researchers, with most considering it their responsibility to ensure that their research is translated. However, many researchers feel they do not have skills or knowledge of strategies to translate the knowledge gained from their research. Researchers typically focus on sharing their knowledge through traditional diffusion strategies, with more tailored dissemination approaches used to a lesser extent. Further, whilst most participants had informed end-users of their research findings, only half of the sample also had experience with consulting end-users about a research component or involving them throughout the research process. Only slightly more than 1 in 4 researchers in this study reported an experience working in genuine partnership with end-users and only 1 in 6 had conducted end-user-initiated research. These findings are aligned with other studies [12–16] conducted in other health-related areas where traditional diffusion strategies were more frequently used than tailored approaches.

However, our study did find differences in the use of dissemination strategies. Training in KT was found to be associated with greater perceived KT skills and knowledge of KT strategies. It was also associated with greater use of tailored dissemination strategies, such as developing new educational materials/sessions and small group meetings or workshops, and end-user engagement activities, such as partnering with end-users, compared to those without. The benefits of KT training were also documented in a recent study where trainees had greater knowledge of KT, perceived skills to practice KT, and greater perceived ability to engage with end-users after receiving KT training [29]. This suggests that providing KT training to transfusion medicine researchers may be an effective strategy to increase KT in this area. Whilst this difference may be attributed to researchers with an interest in KT undergoing training, many of our surveyed sample identified that they would like to have access to KT education and training [25]. Further research is needed to develop and evaluate a KT training programme for transfusion medicine researchers as a way to increase their knowledge, confidence, and use of KT activities.

Our research also identified a difference in KT views and activities by career stage. Established researchers reported greater knowledge of KT strategies, skills to facilitate KT, and available funding for KT than less experienced researchers. This discrepancy in abilities and resources may have affected KT practices, with established researchers having written detailed reports, developed new education materials, and engaged end-users in their research to a greater extent than early/mid-career researchers. A potential explanation for this finding may be that researchers working in transfusion medicine for a longer period of time have had the opportunity to conduct more research and therefore have had a greater need for knowledge to be translated compared to researchers relatively new to the area. Further, they may have had more time to form connections with end-users and gain experiential knowledge on effective KT strategies as no significant differences were found between the two groups in self-reported KT training. It is important that this knowledge is shared with early and mid-career researchers to support their KT efforts through for example mentoring or collaboration through facilitated networks [30–32]. It is recommended that these knowledge sharing strategies are further investigated.

Another factor that appears to affect KT practice is the setting in which the researcher is located. We found that researchers working solely in an academic setting reported more traditional diffusion strategies and less end-user engagement activities than researchers working (to some extent) in an applied setting. There are several possible explanations for this finding. Some academic institutions may place a greater emphasis on traditional diffusion methods, such as peer-reviewed publications, as performance indicators and considerations for promotion. In contrast, health services may place a greater value on research that leads to improved outcomes for their patients, blood donors, staff, or the health service itself [33]. Further, funding may affect the type and topic of the research conducted; researchers working in applied settings are often funded directly by the blood collection agency or health service who desire practical solutions to their issues [22]. In contrast to health services, external funding bodies may place more emphasis on traditional diffusion strategies [34, 35]. Finally, researchers working in an applied or joint position within a blood collection agency or other health service may have had more opportunities to create end-user networks and find it easier to engage with these networks throughout the research process. As a result, the knowledge generated through the research may be more directly relevant to issues faced by the blood collection agency or health service and more easily translatable to policy and/or practice [5, 10, 11, 36].

Of equal interest is the limited differences observed between basic and applied science researchers. In our study, with the exception of basic science researchers reporting greater KT skills, no differences were found between basic science researchers and applied science researchers in their views of KT, how they share their knowledge, and the extent they engage end-users in their research. This is somewhat surprising as the literature has suggested that the purpose of KT differs between the two groups. Basic science researchers are assumed to focus on translation to clinical science and knowledge, with outcomes such as clinical use or commercialisation of new treatments. On the other hand, applied sciences are assumed to focus on translation to healthcare and services, with outcomes such as treatments are being used appropriately [19, 20]. However, our findings align with the experiences of stroke rehabilitation researchers, in which pre-clinical and clinical researchers reported similar research translation views and practices [28]. This suggests that, whilst their KT purpose may differ, basic and applied science researchers apply similar KT dissemination and end-user engagement activities.

Limitations

There were several limitations to the study. First, researchers with no interest in KT may have opted out of participating affecting the generalisability of the results. Second, the sample size was relatively small in comparison with the number of survey invitations sent directly to corresponding authors and grant recipients as well as likely views of the social media posts. However, our

sample was diverse in the type of research, work setting, location, career stage, and self-reported KT training suggesting our insights reflect the broader transfusion medicine research community. Third, our sample may include research trainees as we did not screen for this in our survey. Whilst this may have influenced some of our findings regarding less experienced researchers, our recommendation for the need to better support less experienced researchers through sharing knowledge of established researchers remains. Fourth, the study materials, including the questionnaire, were only presented in English, which may have limited our sample to researchers fluent in English. Nevertheless, our sample does include participants from a wide range of countries. Fifth, we only focused on two aspects of KT, and further research is needed to examine researchers' practices relating to the synthesis and application of knowledge. Finally, KT activities were self-reported and assessed over their career in general as a transfusion medicine researcher, which may have led to some recall bias. In addition, it may have also led to social desirability bias causing overreporting of KT activities. Future research could look to measuring KT activities more objectively.

Conclusions

This study showed that transfusion medicine researchers consider KT as being important and feel it is part of their responsibility. However, there appear to be gaps in their knowledge and limited support to conduct KT. Our work highlights that KT knowledge needs to be shared across all health-related areas, including transfusion medicine, to ensure knowledge producers, such as researchers, can benefit from advancements made in the field of KT and implementation science.

Abbreviation

KT Knowledge translation

Supplementary Information

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Additional file 1. STROBE Statement—checklist of items that should be included in reports of observational studies.

Additional file 2. Questionnaire Knowledge Translation in Transfusion Medicine.

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Authors' contributions

AT, BM, TD, and AW designed and planned the study. AT was responsible for the study conduct. BM and TD assisted with the data collection. AT wrote the first draft of the manuscript. All authors have been involved in drafting the manuscript and approved the final manuscript.

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Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to privacy restrictions but may be available from the corresponding author upon reasonable request, subject to ethics and institutional approval.

Declarations

Ethics approval and consent to participate

This project has been approved by the University of Sydney Human Research Committee (2021/854).

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Publisher's Note

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	n/a
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	n/a
Study size	10	Explain how the study size was arrived at	n/a

Continued on next page

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	7
		© Explain how missing data were addressed	7
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	n/a
		€ Describe any sensitivity analyses	n/a
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8
		(b) Indicate number of participants with missing data for each variable of interest	21-23
		© *Cohort study*—Summarise follow-up time (eg, average and total amount)	n/a
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	n/a
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	n/a
		Cross-sectional study—Report numbers of outcome events or summary measures	21-24
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	n/a
		(*b*) Report category boundaries when continuous variables were categorized	21
		© If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a

Continued on next page

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	8-11
Discussion			
Key results	18	Summarise key results with reference to study objectives	12-14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Questionnaire Knowledge Translation in Transfusion Medicine

Demographic and professional characteristics
These first set of questions will ask about your demographic and professional background.

In which country are you based? _____

How do you describe your gender?
- Man/Male
- Woman/Female
- Non-binary
- I use a different term
- Prefer not to say

Which best describes the setting in which you work?
- University
- Research institute (not within a university)
- Government department or agency
- Blood collection agency
- Hospital setting
- Healthcare service (not a blood collection agency or hospital)
- Other

Please specify other work setting: _____

Do you also currently work in any of the other settings?
- Yes, namely [*insert dropdown with previous question options*]
- No

What type of research are you currently using? Please select all that apply:
- Animal studies
- Biospecimen analysis research
- Data linkage research
- Epidemiological research
- Interventional/Clinical trials research
- Qualitative research
- Quantitative research
- I do not conduct research
- Other

How many years have you worked within the area of transfusion medicine? _____

Have you ever received training on translating research into policy and/or practice (i.e. knowledge translation)?
- Yes
- No
- Unsure/Don't know

Knowledge translation activities
These next set of questions will ask you about any activities you may undertake to share your research findings, and the possible response categories range from *never* to *always*. When answering these questions, please keep in mind that how often you undertook each activity may depend on how often it was feasible for you to do so, given the nature of the activity and the context in which you work.

- If you undertook a particular activity whenever it was feasible to do so, please indicate:

    - *always* if you undertook the activity every single time it was feasible or
    - *frequently* if you did so almost every single time it was feasible.
- If you undertook a particular activity at least once but much less often than it was feasible to do so, please indicate:
    - *occasionally* if you undertook the activity more often than not or
    - *rarely* if you hardly ever did so.
- If you never undertook a particular activity whether it was feasible to do so or not, please indicate *never*.

Diffusion activities

To what extent do you do the following activities to disseminate your research findings? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently, 5=Always)

- Publishing in peer reviewed journals
- Presenting at an academic conference
- Detailed research reports

Dissemination activities

To what extent do you do the following activities to disseminate your research findings? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently, 5=Always)

- Developing new educational materials/sessions
- Preparing policy or evidence brief and disseminating them to relevant audiences (e.g., policy-makers, health service providers or administrators)
- Organising interactive small group meeting/workshop
- Writing plain language summaries
- Engaging with social media (e.g. Facebook, Twitter)
- Organising a media release/outreach campaign
- Creating networks or networking with end-users such as policy-makers and practitioners (e.g., give presentations to relevant networks)
- Engage champions or opinion leaders (e.g., directors, managers) to assist with sharing of research findings

End-user engagement activities

This section asks about your knowledge and experience with engaging potential end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) in research.

At what level have you engaged end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) in your research? *[multiple choice]*

- Letting them know about your research findings.
- Obtaining their feedback or input in any component of research.
- Working directly with end-users throughout the research process to ensure that concerns and aspirations are consistently understood and considered to the maximum extent possible.
- Partnering with end-users (i.e. shared decision-making) in each aspect of the research process.
- End-user initiated research.
- I have not engaged end-users in my research. *[exclusive option > skip to next block]*

[*If selected "Letting them know about your research findings"*] How did you let them know about your research findings? [*multiple choice*]

- Sent them my research papers
- Sent them evidence briefs or plain language summaries

- Presented my research to them
- Held meetings, roundtables or forums to discuss my research

Who have you engaged in the research process? Please select all that apply:

- Blood donors
- Blood recipients
- Blood collection staff
- Blood processing staff
- Senior management
- Policy makers
- Hospital staff
- General public
- Other, namely: _____

There are different points in the research process where end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) could potentially be engaged. Please indicate those research phases where you have experience engaging with end-users. Please select all that apply:

- Research priority-setting
- Grant proposal/protocol writing
- Input into methodology/study design
- Development of research questions
- Data collection
- Data analysis
- Interpretation of results
- Input into the selection of research translation products
- Evaluation of research processes
- Determining future research priorities stemming from the results
- Other, please specify….

Importance and responsibility for knowledge translation

We would like to know more about your views on who should be responsible for and the importance of translating research into policy and/or practice.

Please rate your agreement with the following statements: (1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree)

1. It is important to me that my research is translated.
2. My research is not the sort of research that can be translated.
3. It is my responsibility to ensure that my research is translated.
4. Research translation is the responsibility of someone else in my team
5. Researchers should be responsible for translating findings into practice.
6. Stakeholders should be responsible for translating research findings into practice.
7. I know which strategies should be used (by myself/others) to translate research.
8. I have the skills to ensure research is translated.
9. There is adequate funding available to support translation of research.
10. Spending time on translating my research would take me away from research or other work-related activities I enjoy.
11. Researchers with experience/interest in implementation should translate research.
12. Every research team should include a researcher with expertise in implementation.

Chapter Five

The use of research evidence in blood collection policy and practice: a qualitative study with front-line staff, middle managers, and senior managers

Preface

5.1 Chapter overview

This chapter consists of a published manuscript entitled "*The use of research evidence in blood collection policy and practice: a qualitative study with front-line staff, middle managers, and senior managers*", which reports the findings from Study 3.

In this qualitative study, I interviewed potential knowledge end-users to gain an understanding of how they have engaged with and used research. I interviewed three groups of participants working at different levels (frontline staff, middle managers, and senior managers) in the same department focused on blood collection within one organisation. I applied the SPIRIT Action Framework to explore their views on their own as well as their organisation's capacity to engage with research, how they engage with research and researchers, and their experiences of using research in their professional role. This study provided insights into experiences of knowledge translation by end-users and helped to identify opportunities to strengthening knowledge translation in transfusion medicine as discussed in Chapter 6.

5.2 Publication details

This chapter has been accepted for publication and is in the format required by *Health Research Policy and Systems*, a leading journal in knowledge translation:

> **Thijsen A**, Masser B, Davison TE, Edwards AR-A, Moore G, Williamson A. The use of research evidence in blood collection policy and practice: a qualitative study with front-line staff, middle managers, and senior managers. 2025 [Manuscript accepted for publication]

The article includes the following supplementary materials:

- Interview Guide – Frontline staff
- Interview Guide – Middle Managers
- Interview Guide – Senior managers

5.3 Authors' contributions

AT designed and planned the study with guidance from BM, TED, and AW. AT was responsible for the study conduct including data collection. AT and AR-AE analysed the data under guidance of AW. AT wrote the first draft of the manuscript. All authors have been involved in drafting the manuscript and approved the final manuscript.

The use of research evidence in blood collection policy and practice: a qualitative study with front-line staff, middle managers, and senior managers

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ABSTRACT

Background: There is a known disconnect between scientific knowledge and its application in routine practice, known as the research-practice gap. A potential strategy to encourage research engagement among end-users is embedding researchers within an organisation. This study set out to understand the views and experiences of senior managers, middle managers, and front-line staff in one department accessing and using research in a large organisation with embedded researchers. We also investigated staff capacity to engage with research to identify opportunities to strengthen the use of research-based evidence in practice.

Methods: We conducted 14 semi-structured in-depth interviews between November 2022 and April 2023 with senior managers, middle managers, and front-line staff working in the blood collection department at Australian Red Cross Lifeblood. Directed qualitative content analysis and the SPIRIT Action Framework were used to interpret the data.

Results: Capacity to engage with and use research varied greatly between participants and appeared to be affected by their role, training, and prior work experience. Participants valued research highly. However, only a few felt confident in their knowledge and skills to engage with research. Participants described a lack of visibility of research within the organisation as well as systems and structures to access research. Experiences with accessing research, generating research, and interacting with researchers were mostly limited to senior managers. Research was chiefly used by senior managers to support changes, followed by understanding blood collection issues, and informing policy development. Although present, research use was often not visible to front-line staff.

Conclusions: To increase research engagement and use, organisations should invest in strengthening their tools and systems, providing opportunities to increase individual knowledge and skills to engage with research, and increase the visibility of research and how it has been used.

Keywords: research use, research engagement, SPIRIT Action Framework, blood, evidence-informed policy making, front-line staff, middle managers, senior managers, policy makers

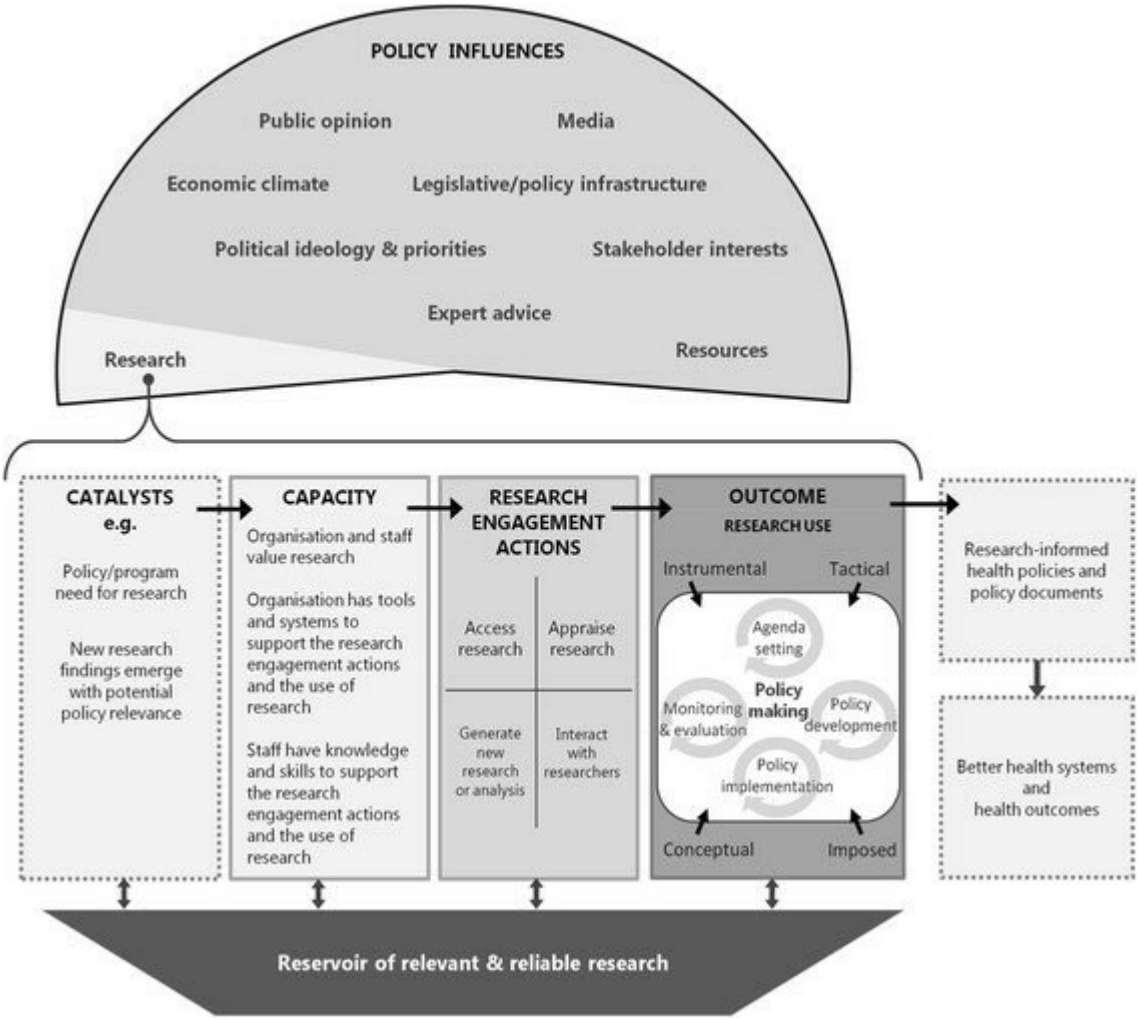
BACKGROUND

Research is a source of knowledge that can help organisations improve their policies and procedures as well as overcome potential challenges. However, there is a known disconnect between scientific knowledge and its application in routine practice, known as the research-practice gap [1, 2]. Consequently, policies and procedures may not be aligned with current evidence, leading to high costs, inappropriate practices, and waste of resources [3].

To facilitate knowledge translation (KT), it is essential for end-users to be able to access, understand and apply research evidence, but also to be motivated to embed research into practice [4]. However, end-users at various levels within an organisation may experience barriers to engaging with research. Frontline staff often have insufficient time to engage with research due to heavy workloads, lack of relevant skills, negative views on benefits of research to practice, and their roles often being task-oriented without authority to change practice [5, 6]. Middle managers have been identified as instrumental in summarising research and disseminating this knowledge with their frontline teams [7]. However, they may also have limited knowledge of how to access, interpret, and appraise research. Further, research engagement of frontline staff and middle managers is affected by how it is supported and valued within the organisation (i.e. the implementation climate) [4, 7].

A potential strategy to overcome the research-practice gap and encourage research engagement is to embed researchers within non-academic organisations. This strategy can increase the likelihood that research activities and the knowledge needs of policy-makers and practitioners (i.e., end-users) are aligned [2, 8, 9]. Further, it can build the capacity of end-users through exposure to research activities and provide opportunities to collaborate on finding solutions to organisational issues [2, 8]. Embedding researchers in organisations has been shown to increase end-users' access to research-based evidence, which can be used to address organisational challenges and create positive change [10].

Fig. 1 The SPIRIT Action Framework



Source: Redman et al.[11]

Using the SPIRIT Action Framework, we conducted a qualitative study to explore research engagement amongst staff at an organisation with embedded researchers. The SPIRIT Action framework [11] has three domains (see Figure 1). The first, *individual and organisational capacity*, focuses on potential determinants of research use including a) the value the individual places on using research, b) the confidence the individual has in their knowledge and skills for engaging with research, c) the perceived value their organisation places on using research, and d) the tools and systems their organisation has to support research use. The second, *research engagement actions*, focuses on potential actions that can be taken to engage with research and researchers. These include a) accessing research, b) appraising research for relevance and quality, c) generating or commissioning research and analyses, and d)

interacting with researchers. The last domain, *research use*, captures the way in which research informs policy or practice. This domain captures a) conceptual use – where research is used to clarify understanding about a policy or practice issue, b) instrumental use – where research evidence directly informs policy or practice, c) tactical use – where research evidence is used to help justify or persuade others to support a predetermined decision, and d) imposed use – where research evidence is used due to organisational requirements.[11, 12] The aims of the current study are to: 1) provide insight into how research is engaged with and used at an organisation with embedded researchers from the perspectives of people working at various levels; and 2) identify opportunities to strengthen KT.

METHODS

The study was conducted at Australian Red Cross Lifeblood (Lifeblood), which is the sole collector and provider of blood and blood components in Australia, collecting blood from voluntary and nonremunerated donors. Lifeblood is unique through its hybrid focus on manufacturing and supply of blood and blood-related products to the health sector, ensuring appropriate care and health of blood donors, and encouraging continued volunteerism of donors. It has an internal Research and Development (R&D) department which conducts basic and applied research to address problems faced by Lifeblood as well as gaps in knowledge in broader transfusion medicine. Our study population included members of the department focusing on blood collection which has a great potential for research engagement due to the applied nature of the research engaged in and R&D's strong focus on solving blood collection problems [13]. We interviewed three groups of participants: 1) senior managers – responsible for policy development, 2) middle managers – donor centre managers and area managers who manage blood collection centres, and 3) front-line staff - registered nurses and non-medically trained nursing assistants who collect blood.

Data collection

The study was approved by the University of Sydney Human Research Ethics Committee (reference number 2020/254) and the Australian Red Cross Lifeblood Ethics Committee (2020#14). Semi-

structured interviews were conducted by the first author from November 2022 to April 2023. A purposive sampling strategy [14] was adopted to ensure participants were diverse in their professional roles and locations. We invited five senior managers and five area managers (i.e. middle managers) to participate in the study via email. One of the senior managers, responsible for overseeing research activities in blood collection centres, then identified centres available to be contacted for our study. We first invited the centre manager (i.e., middle manager) to participate in an interview and they assisted in selecting front-line staff to participate in the study based on their workload and availability.

In total, fourteen staff members participated in this study: five senior managers, six middle managers, and three front-line staff members from different centres. This sample size was deemed adequate to answer our research question while working within our constraints of available research participants and time [15]. Data collection occurred at a time when there were front-line staff shortages making it difficult for staff to leave their daily tasks such as collecting blood to participate in interviews. Participants had worked at the organisation between 3 and 31 years.

Topic guides were tailored specifically for each participant group (see Supplementary Materials). With written consent, interviews were conducted via MS Teams, and each lasted 26-57 minutes. All interviews were recorded, and transcribed verbatim.

The researchers

The first author has worked as a researcher in the R&D department for eleven years. The second author holds a joint research position with the University of Queensland and R&D at Lifeblood and has worked in blood donation research for 23 years. The third author has previously worked as an internal researcher within R&D at Lifeblood for five years. These experiences and knowledge of the area informed the study approach, including study design, participant recruitment, data collection, analysis of data, and interpretation of the findings. Further, the researchers' insider perspective may have resulted in more appropriate interpretation of the data due to a better understanding of the organisational context. The

use of a coding framework as well as adherence to ethical and professional standards minimised the risk of potential bias.

Data analysis

Directed qualitative content analysis [16] was used to analyse the data. Guided by the SPIRIT Action Framework [11], a predetermined coding framework was developed including the following domains: capacity, research engagement actions, type of research use, and purpose of research use. First, transcripts were checked against the audio files which simultaneously allowed for familiarisation with the data. Second, the predetermined codes were pilot tested by two authors (AT, AE) independently applying them to two transcripts in MS Word with model fit subsequently discussed. Third, all transcripts were uploaded to NVivo (QSR International) for coding and analysis. The first author then applied the coding framework to all transcripts. Relevant data that did not fit into the predetermined coding framework were inductively coded. Finally, descriptions were written for each SPIRIT domain by examining the categories, codes, and coded data.

RESULTS

1. Capacity for research use

1.1 Research is valued.

All participants felt that research was "important" and of "interest" to their work facilitating blood collection. In particular, health-related research was valued highly by participants because they perceive that they work in health and often had a background in nursing.

> *"Data and research I think are fundamentals for anyone who's playing in the healthcare space."* (Senior manager)

However, some participants, in particular front-line staff, felt that it was unclear how research was used to inform blood collection policies and practices.

"*For there to be an understanding that the changes we make and the things that we do are driven by research …we would have a lot of people that would not even know that. What is research? We would have a lot of people that don't understand where that sits with us in an organisation.*" (Middle manager)

1.2 Knowledge and skills.

Participants reported a mixed level of knowledge and skills to engage with research, influenced by their educational background and prior work environments as opposed to their current position. For example, one senior manager felt confident engaging with research evidence through their previous work experience. When asked if they found it easy to apply research evidence, their response was:

"Personally, I think it is, because I've been in roles in the past in healthcare, or in government, or in the universities. I don't know if everyone at Lifeblood, who I work with has that know-how though… But that's because I've been trained in that, and I've done it before." (Senior manager)

Other participants expressed less confidence in appraising, interpreting, and applying research due to a lack of education and/or training.

"I see a lot of research papers come through and it's just way over my head, because I don't come from that… The research papers that I like to see are the ones that are a bit more basic for want of a better word, in terms of you don't need that clinical expertise or scientific expertise." (Senior manager)

1.3 Tools and systems.

The most frequently reported mechanism for accessing research was the inclusion of a plain language summary in a department newsletter. In particular, this was viewed as the only method for front-line staff to learn about research.

"*I think that would probably be the only thing that I can think of that I would know about there being research being conducted and what the outcome was.*" (Front-line staff)

Another reported mechanism for sharing research evidence was the internal library service. However, only two participants – from the same team – mentioned using the internal library service to access research. Many other participants did not know about it or believed it no longer existed.

> "*We've had a really good library, and you used to get an email out to say, "Oh, there's an article on whatever it was." And you could often request the article. But we obviously don't have a library anymore, or we do, but no one sends anything out.*" (Middle manager)

Being a member of a committee was another mechanism for senior managers to learn about research and interact with researchers: "*We've got the committee, so we can hear what's coming up and papers and things we can see in that committee.*" (Senior manager). However, this was limited to senior managers; front-line staff and middle managers reported an absence of formal structures where they could hear about or interact with research: "*I don't think there's any set way that we share the information.*" (Middle manager). Other avenues mentioned by senior managers included webinars hosted by researchers, ad hoc meetings with researchers, and receiving a copy of the R&D annual report.

In general, many participants felt there was a lack of a formal organisational structures or systems in place for them to access research. A few middle-managers and front-line staff could not recall receiving any information about research. As one participant explained:

> "*It isn't something that is easily accessed. If I currently was like, I'm really interested in X, I wouldn't know where to go… you'd have to go through people and hope that they know where to look. There's no ease of access. I would say that is a problem.*" (Middle manager).

A few participants who were relatively new to the organisation also highlighted that accessing and learning about research is not included in training for new staff.

> "*I don't believe it sits alongside our training program at all …We do a lot of virtual learning and training now, and most of it's about compliance and stuff. But there isn't really a lot of research in any of that.*" (Middle manager).

2. Research engagement actions

2.1 Accessing research

Some senior managers had actively searched for research to support their work, in particular those with a clinical background. However, they mentioned preferring to receive information rather than searching for it due to time constraints.

> *"I love being pushed for information, I'm not great at trying to find it myself. That's probably more reflective of my workload and time."* (Senior manager).

This experience was shared among middle managers and front-line staff. Most had not actively searched for research because of time constraints or not knowing where to look. As one participant explained:

> "*You just don't know where to look. Like, you don't have time to learn where all that stuff is. It's hard enough just learning where the [blood collection] resources are, let alone anything else to be honest.*" (Front-line staff).

2.2 Appraising research

Of those who had accessed research, most did not indicate appraising its relevance and quality. This may be attributed to a lack of understanding of the content and methods of the research:

> "*I would read, but a lot of the data goes over my head unless it's in a graph form that I can easily understand or a pie chart or something. But a lot of it's interesting, really interesting.*" (Front-line staff)

2.3 Generating research or analysis

Some senior managers indicated that they had partnered with researchers to conduct research. Two participants in particular highlighted collaborating with researchers to develop questionnaires and perform statistical analysis to evaluate an initiative.

> *"I do work with researchers, and including researchers' help really and even statistical help and understanding the analysis and the reports. We've worked with researchers to set up survey questions and to get it done correctly."* (Senior manager)

The other senior managers rarely commissioned research activities and were often informed of research evidence without playing an active role in generating it. When asked about any barriers to generating research, one participant mentioned a lack of motivation in the department: *"I don't think there's a barrier. I think there needs to be more of an appetite for it."* (Senior manager). However, a potential method to overcome this barrier is to have someone actively championing the research:

> "*If you put it on Connect [internal website], you put it on the R&D page or whatever, no one's gonna see it, no one's gonna talk about it. The only time that you'll get investment from probably most of the businesses is if someone was leading and driving and communicating it.*" (Senior manager)

2.4 Interacting with researchers

Experiences of interacting with researchers was limited to senior managers and a few middle managers. All of the senior managers had regular interactions with researchers via meetings which would inform them about current research activities and findings. This exposure was seen as beneficial to be able to identify sources of information at a later date:

> "*...we can see what people are doing the research into, we can see the papers. And I think we know who to go to if we need more information.*" (Senior manager)

However, one of the participants also highlighted that the timing of when the research is shared by the researcher and when it is needed by the end-user do not always align, demonstrating the need for other engagement strategies.

> "*We will go looking for it, maybe not when you want to tell us but there'll be a time where we'll think, "Oh, yeah. We heard about that. Let's go back and see what happened and what information we can find."*" (Senior manager).

One middle manager mentioned being part of a steering committee of a research project because she was interested in the topic and reached out to the research team to be involved. Other middle managers talked about facilitating research activities in their centres such as collecting extra blood samples.

"We were taking extra blood sample tubes for someone to collect. I was across that. But if it wasn't my centre, I may not necessarily know that research is happening in the background." (Middle manager)

3. Research use

3.1 Tactical

The most frequently reported use of research among senior managers was to support changes being made to policies and procedures. Senior managers reported they used research evidence to prepare papers for internal meetings to support a decision they would like to be made. They also indicated sharing this evidence in their communications to blood collection teams to encourage uptake of the change.

"For me, in my teams and our delivery of change or delivery of any program is there is science behind it, and you have to tell the people that. That's how you get their buy in." (Senior manager)

However, the use of research in policy decisions was not always visible to middle managers and front-line staff. They expressed the desire to learn more about the research evidence that either informed or supported proposed changes. For example, when asked how important it was that changes were supported by research evidence, one participant responded: *"To me it's very important, because that's how I function, evidence-based practice. I want to know all that to make sure that I'm operating with integrity."* But when asked if the evidence behind a change is often shared, she responded: "*No, not as much. If a change is implemented, it's just like, "heads up, this change is happening." Often there's no why. So, people just go, "Oh, another change. What's happening?" Whereas maybe if you had a why..."* (Front-line staff).

3.3 Conceptual

Senior managers recalled having used research conceptually to provide insights into issues the organisation was facing and using that research to inform policy changes. For example, one participant explained his view on the role of research:

> *"Research is like the engine at the forefront of, like finding out why and then bring it to us and go well, this is what donors are saying or non-donors or lapsed donors are saying... Then we need to change it into ways our team can understand that research, turn into an operational BAU, and ensure that we communicate it to the team."* (Senior manager)

Similarly, interventional research that was seen as too complicated and not fit for purpose had been used as inspiration for new procedures. For example, one senior manager described using a research study as inspiration to develop a new tool to improve collection success:

> *"[The research] was a little bit complicated and it didn't work. But that was a springboard for me."* (Senior manager)

3.2 Instrumental

To a lesser extent, research was also reported to directly inform policy or practice changes. Participants mentioned using research evidence to inform changes to clinical practice such as donor selection criteria. As one participant explained:

> "*The research that's happening and what we're seeing out there does cascade through into changes to [standard operating procedures] or instructions or how we go about doing our work.*" (Senior manager)

3.4 Imposed

None of the participants indicated that the organisation required them to use research.

DISCUSSION

This study examined the capacity and extent of research engagement of frontline staff, middle managers, and senior managers in one department within a blood collection agency with an embedded

research team. Capacity to engage with research varied between senior managers and the other levels. Whilst research evidence was highly valued by all participants, middle managers and frontline staff described a lack of visibility of research within the organisation. Further, participants reported mixed knowledge and skills around engaging with research, influenced by their educational background and prior work settings. Senior managers most often reported more awareness of organisational tools and systems. They also reported more experiences engaging with research, such as accessing research evidence and interacting with researchers. However, almost all participants engaged with research evidence passively due to time and workload constraints. Research was mostly used by senior managers as evidence to support a predetermined decision, provide insights or generate ideas to manage blood collection issues, or to inform changes to blood collection policies. However, this use was often not visible to middle managers and frontline staff who expressed a desire to see more research evidence in communications about changes made to policies, procedures, and guidelines to increase their understanding of the change and motivate uptake.

To our knowledge, this was the first study to examine research engagement among end-users in a blood donation setting. The experiences reported here, however, are similar to those noted in other health-related fields [17-19]. Barriers to research engagement, such as lack of time, poor access to research evidence and perceived lack of relevant research evidence, were also found in our study. Our recent review of the literature indicated that blood donor research literature is in the early stages of KT [20], which may affect the availability of relevant research evidence to end-users. Further, research has shown that transfusion medicine researchers typically engage in traditional diffusion strategies and consult with end-users but to a lesser extent use tailored dissemination strategies and actively engage end-users in their research [21, 22]. These actions by researchers may have affected the engagement actions and research use observed in our study.

A closer examination of determinants in the Capacity domain shows opportunities to strengthen research engagement as these determinants are potentially modifiable [12]. At an individual level, research was valued. However, the confidence of participants to engage with research appeared to be

dependent on their education and prior work experience regardless of their managerial level. Individual capacity can be built through training, or individual or team-based mentoring with a KT specialist or researcher, both of which have been shown to increase research engagement [23-25]. At the organisational level, how research was used lacked visibility and gaps were identified around tools and systems to support research engagement. Research infrastructure might be improved through increasing awareness of and access to the internal library, an accessible research evidence database, and/or regular meetings highlighting relevant research accessible to all staff [25-27]. Further, how research has informed new or changes to existing policies or practices should be highlighted to increase visibility of research and encourage uptake among middle-managers and front-line staff [28]. Finally, dedicated KT positions, such as a senior leadership position for KT, could be introduced to champion research engagement and use through facilitating relationships between researchers and end-users, summarising relevant research, and providing research expertise to business priorities [24, 26].

Limitations

It is important to note the limitations of this study when considering the findings. First, our sample size was limited to fourteen participants. We achieved good representation of senior and middle managers within the single department targeted. However, we were only able to recruit three frontline staff from different centres due to recruitment occurring during frontline staff shortages. Further, we were limited in our recruitment to select blood collection centres due to organisational procedures. Whilst our participants provided great insights, a future survey study with a shorter time commitment could further explore some of these experiences among frontline staff. Second, due to the qualitative nature of this study, the information provided was subjective. The organisation could have more tools and systems in place to support research engagement than reported. Finally, the study was conducted within a single department of an organisation and additional work is needed to understand research engagement in other areas of the organisation and other blood collection agencies.

Despite these limitations, this study provides insights into research engagement capacity, actions, and use of research of end-users working in a department within an organisation with embedded researchers and identified opportunities to further strengthen the visibility and use of research evidence in practice.

List of abbreviations

KT = Knowledge Translation

R&D = Research & Development

Declarations

Ethics approval and consent to participate

This project has been approved by the University of Sydney Human Research Committee (2020/254) and the Australian Red Cross Lifeblood Ethics Committee (2020#14).

Consent for publication

Not applicable.

Availability of data and materials

The data generated and/or analysed during the current study are not publicly available due privacy restrictions, but anonymised copies of original transcripts may are available from the corresponding author on reasonable request, subject to ethics and institutional approval.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AT, BM, TD, and AW designed and planned the study. AT was responsible for the study conduct including data collection. AT and AE analysed the data under guidance of AW. AT wrote the first draft of the manuscript. All authors have been involved in drafting the manuscript and approved the final manuscript.

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Interview Guide – Frontline Staff

Introduction

Before we start, I would like to know a little bit more about what you do at Lifeblood.

- Can you tell me about your current role at Lifeblood?
    - How long have you been in your current position?
- When did you start to work for Lifeblood?
    - Have you changed positions since you started?
    - And in your current role, have you always worked at this donor centre?

Research Focus 1: Implementing changes

This study is about understanding changes made at Lifeblood that are based on research evidence. Often, changes introduced in blood collection procedures and donor management are based on findings from research conducted within Australia or internationally. These can be changes made to for example standard operating procedures, forms, equipment, donor educational materials, or donor eligibility criteria.

- Are you aware of any practice changes at your donor centre or within the wider organisation that are based on research findings?
    - [If yes:] Can you briefly describe the changes that have occurred?
    - [If no:] Examples of recent changes based on research was the removal of the vCJD deferral, the recommendation for women aged less than 46 years to take a course of iron or instructing donors to use applied muscle tension during their donation.
- How are you usually informed about any practice changes? (Prompt for method [email, staff meetings], and who informs them [manager, peer])
    - What are you usually told about the change? (Probe for reason for the change)
- How important is it to you that changes are supported by research evidence? Why? Why not?
- How often do you find that changes that are being recommended are actually being implemented into routine practice?
    - How does your team make sure that changes are implemented into routine practice?
    - How does your team make sure that changes are sustained over a longer period of time?
- Can you describe an example of a change based on research evidence in your centre that went well? Why do you think it was successful?
- Can you describe an example of a change based on research evidence in your centre that didn't go so well? Why do you think it didn't work?

- In your opinion, what can be improved in how changes based on research evidence are introduced?

Research Focus 2: Knowledge translation activities

In my next set of questions, I would like to ask you about your access to knowledge from clinical research findings and other evidence-based practices. This could be new knowledge created by researchers working at Lifeblood or from international research groups. These can be shared through presentations, summaries, or in newsletters.

- Have you ever received any information about research findings? [If yes:] How has this been shared with you?
    - What do you think of these documents/presentations? Are they easy to understand?
    - Have you shared or discussed this knowledge with your team? How?
- Do you ever look for research evidence for your work or in relation to your work? Why (not)?
    - [If yes:] How do you look for it?
- What do you think is the best way to share research evidence with you?
- Do you feel like you are you encouraged to learn about new knowledge in your role? How are you encouraged?
- Apart from this study, have you ever been asked to participate or work on a research study while working at Lifeblood?
    - [If yes:] Can you tell me more about that?
    - [If no:] What are your thoughts on being involved with research?
- What are your thoughts on your role in sharing and using research evidence at Lifeblood?

Conclusion

Thank you for your time today. We're at the end of our interview. Is there anything we haven't discussed that you would like to add?

Interview Guide – Middle Managers

Introduction

Before we start, I would like to know a little bit more about what you do at Lifeblood.

- Can you tell me about your current role at Lifeblood?
    - How long have you been in your current position?
- When did you start to work for Lifeblood?
    - Have you changed positions since you started?
    - And in your current role, have you always worked at this donor centre?

Research Focus 1: Implementing changes

This study is about understanding changes made at Lifeblood that are based on research evidence. Often, changes introduced in blood collection procedures and donor management are based on findings from research conducted within Australia or internationally. These can be changes made to for example standard operating procedures, forms, equipment, donor educational materials, or donor eligibility criteria.

- Are you aware of any practice changes at your donor centre or within the wider organisation that are based on research findings?
    - [If yes:] Can you briefly describe the changes that have occurred?
    - [If no:] Examples of recent changes based on research was the removal of the vCJD deferral, the recommendation for women aged less than 46 years to take a course of iron or instructing donors to use applied muscle tension during their donation.
- How are you usually informed about any changes? (Prompt for method [email, meetings], and who informs them [manager, peer])
    - What are you usually told about the change? (Probe for reason for the change)
- How important is it to you that practice changes are supported by research evidence? Why? Why not?
- How often do you find that changes that are being recommended are actually being implemented into routine practice?
    - How do you usually make sure changes in practice are implemented in your donor centre?
    - Who is usually responsible for overseeing these changes?
    - What strategies do you use to make sure that your team sustains the change?
- Can you describe an example of a change based on research evidence in your centre that went well? Why do you think it was successful?
- Can you describe an example of a change based on research evidence that was implemented at your centre that didn't go so well? Why do you think it didn't work?

- In your opinion, what can be improved in how changes based on research evidence are introduced?

Research Focus 2: Knowledge translation activities

In my next set of questions, I would like to ask you about your access to research knowledge and evidence. This could be new knowledge created by researchers working at Lifeblood or from international research groups. These can be shared through presentations, summaries, or in newsletters.

- Have you ever received any information about research findings? [If yes:] How has this been shared with you?
    - What do you think of these documents/presentations? Are they easy to understand?
    - Is this knowledge discussed within your team? How?
- Do you ever look for research evidence for your work or in relation to your work? Why (not)?
    - [If yes:] How do you look for it?
- What do you think is the best way to share research evidence with you?
- Do you feel like you are you encouraged to learn about research and evidence in your role? How are you encouraged?
- Apart from this study, have you ever been asked to participate or work on a research study while working at Lifeblood?
    - [If yes:] Can you tell me more about that?
    - [If no:] What are your thoughts on being involved with research?
- What are your thoughts on your role in sharing and using research evidence at Lifeblood?

Conclusion

Thank you for your time today. We've reached the end of our interview. Is there anything we haven't discussed that you would like to add?

Interview Guide – Senior managers

Introduction

Before we start, I would like to know a little bit more about what you do at Lifeblood.

- Can you tell me about your current role at Lifeblood?
    - How long have you been in your current position?
- When did you start to work for Lifeblood?
    - Have you changed positions since you started?
    - Have you worked at a donor centre?

Research Focus 1: Role of research evidence in making changes

This study is about understanding how research evidence is used to inform policy and practice changes at Lifeblood. This can be evidence based on research conducted at Lifeblood or externally. I would now like to ask you about the role of research evidence in making changes to blood collection procedures, donor selection guidelines, and standard operating procedures at Lifeblood.

- What role, if any, does research evidence play in making any changes to blood collection procedures and guidelines?
- How important is it to you that changes to policy and practice are supported by research evidence? Why (not)?
    - Do you find internal research more compelling than international research evidence? Why (not)?
- To your knowledge, has Lifeblood undertaken internal research or commissioned external research to support policy development? [If yes] Can you give an example?
    - Has there been any research commissioned to support the implementation of a policy change? [If yes:] Can you tell me a bit more about this? [If no:] Why?
    - Has there been any research conducted to evaluate a policy change at Lifeblood? [If yes:] Can you tell me a bit more about this? [If not:] Why?
- Is it easy for you to apply research evidence to policy and procedures? Is there anything that makes this challenging or difficult?
- What do you think can be improved in how research is used to inform policy and practice changes?

Research Focus 2: Implementing changes

I would now like to ask you a few questions on how changes are implemented in blood donation centres.

- How do you usually tell donor centre teams that a change is being made?

    - Do you let the teams know that they are based on research evidence? Why (not)?
- How do you usually make sure that changes are implemented in donor centres?
    - Who is usually responsible for ensuring that changes in policy are implemented in practice?
- Do you work with researchers to implement changes that are based on research evidence?
- What strategies are used to make sure that the change is sustained over time?
- Is there a process for determining if policies have been successfully implemented?
    - Could you tell me a bit more about what happens if the implementation is sub-optimal?
    - What do you think could be improved in this process?
- In your opinion, what can be improved in how changes are implemented at Lifeblood?

Research Focus 3: Knowledge translation activities

In my next set of questions, I would like to ask you about your access to research knowledge and evidence. This could be new knowledge created by researchers working at Lifeblood or from international research groups. These can be shared through presentations, summaries, or in newsletters.

- Have you ever received any information about research findings? [If yes:] How has this been shared with you?
    - What do you think of these documents/presentations? Are they easy to understand?
    - Is this knowledge discussed within your team or senior leadership group? How?
- What do you think is the best way to share research evidence with you?
- Do you ever look for research evidence for your work or in relation to your work? Why (not)?
    - How do you look for it? (Prompt for journal alerts, conferences, ask research team)
- How easy is it for you to learn about new research and evidence in your role? Is there anything that makes it challenging or difficult?
- Do you feel like you are you encouraged to learn about research evidence in your role? How?
- Apart from this study, have you ever been asked to participate or work on a research study while working at Lifeblood?
    - [If yes:] Can you tell me more about that?
    - [If no:] What are your thoughts on being involved with research?
- What are your thoughts on your role in sharing and using research evidence at Lifeblood?

Conclusion

Thank you for your time today. We've reached the end of our interview. Is there anything we haven't discussed that you would like to add?

Chapter 6: Discussion

The findings of the three studies included in this thesis have been discussed in detail in **Chapters 2-5**. The goal of this chapter is to discuss the key findings in relation to the overall aim of this thesis, to highlight key opportunities to strengthen knowledge translation (KT) in transfusion medicine, and to provide recommendations for further research.

It is essential to increase the extent to which policies, procedures and practice of blood collection, storage, and usage are aligned with current research evidence. This alignment will increase the likelihood of providing the best available care and high-quality blood products, ultimately improving the health and wellbeing of both blood donors and recipients. KT can help by bridging the gap between research and practice by ensuring that research evidence is effectively shared, understood and applied by end-users. As outlined in the introduction (**Chapter 1**), KT relies on the complex interaction between the characteristics of the research knowledge, the knowledge, attitudes, skills, and behaviours of both researchers and end-users, and the specific – and often different – contexts in which the research is produced by researchers and applied by end-users (Glasgow et al., 2012; Kristensen et al., 2016).

In this thesis, I have presented the first comprehensive investigation into the capacity for KT in transfusion medicine. In **Chapter 2**, I mapped the published literature along the research-to-practice trajectory to explore the potential for knowledge uptake and gain insight into the state of KT in blood donor research. In **Chapter 3**, I reported on the results of an international survey to determine barriers and facilitators of KT experienced by researchers working in transfusion medicine, and to learn what supports researchers believe would help facilitate KT. In **Chapter 4**, I examined the views on and practices of dissemination and end-user engagement among researchers working in transfusion medicine. Finally, in **Chapter 5**, I conducted an in-depth examination of experiences with engaging and using research evidence among end-users working in a department in a blood collection organisation. Together, these studies indicate that the field of transfusion medicine is in the early stages

of KT, and the findings of this thesis provide the groundwork for future research to strengthen the capacity and capability for KT in transfusion medicine. The key findings of the studies and directions for future research are discussed in more detail below.

6.1 Research knowledge

Research knowledge is more likely to be taken up if it is relevant to the needs of end users, reliable, and accessible (Contandriopoulos et al., 2010; Grol & Grimshaw, 2003; Innvær et al., 2002; Kristensen et al., 2016; Redman et al., 2015). Therefore, examining what knowledge is available to be potentially used in policy and/or practice may provide insights into the capacity for KT in transfusion medicine. In the first study of this thesis (**Chapter 2**), I mapped the published literature along the research-to-practice trajectory to examine what research knowledge is available to be translated (Thijsen, Masser, et al., 2021). I focused on vasovagal reactions in blood donation as evidence related to this topic has strong potential for KT due to its emphasis on interventional research and its alignment with the strategic priorities of blood collection organisations internationally (BEST Collaborative, 2025; Ferguson et al., 2007; National Blood Authority Australia, 2021, December; World Health Organization, 2016).

In the review I found that 84% of research relating to vasovagal reactions in blood donation was published in the last two decades, with the majority being classified as observational (non-intervention) studies (66%). Whilst this research is important to further our understanding of vasovagal reactions, the KT potential of knowledge generated in observational studies is limited due to their inability to establish causality, and therefore, do not generate concrete actions for end-users to change policy or practice (Grimshaw et al., 2012; Maki et al., 2014; Oliver et al., 2014; Sterrantino, 2024). Conclusions drawn from observational studies are limited and potentially misleading due to not knowing what influenced the result (i.e., confounding bias), how participants or data are chosen for analysis (i.e. selection bias), and how the exposure or outcome were measured (i.e. information bias) (Maki et al., 2014; Sterrantino, 2024). The findings from these studies are therefore limited in their applicability to policy and practice.

Looking further along the research-to-practice trajectory, a total of 14 different interventions were tested in the knowledge inquiry studies identified in the review, with only three of these assessed in multiple trials. Perhaps unsurprisingly, these three interventions were the only ones found to have been implemented into routine practice (Eder et al., 2011; Goldman et al., 2007; Goldman et al., 2021; Salvadori et al., 2019; Thijsen et al., 2020; Tomasulo et al., 2011; Zeiler et al., 2014). This may suggest that when multiple high-quality studies demonstrate the effectiveness of the same intervention, the evidence is more likely to be perceived as reliable, potentially encouraging its uptake in routine practice – an observation that appears consistent with findings outside of the field of transfusion medicine (Grimshaw et al., 2012; Grol & Grimshaw, 2003; Harvey & Kitson, 2016; Oliver et al., 2014).

Implementation and evaluation studies describe how research evidence was implemented into policy or practice and its effectiveness in settings outside the controlled research environment. These studies enhance our understanding of how and the extent to which implementation is effective in a specific context, identify ways to further strengthen the benefits and improve sustainability of the intervention within that context but also enable others to apply the intervention in different settings (Damschroder et al., 2009; Moore et al., 2015). In my literature review, I was unable to identify any published literature on how interventions targeting vasovagal reactions were implemented. I also only found two studies evaluating the impact of recently introduced practice changes and three studies evaluating the impact of policy changes regarding donor eligibility criteria on vasovagal reaction rates. This presents a significant gap in knowledge on how to effectively translate research evidence into policy and routine blood collection practice. Implementation and evaluation studies provide insights into which strategies are effective in implementing the evidence, what to measure and how long it takes to observe any effects, potential inequalities in intervention uptake, and what factors to consider when translating knowledge to practice (Colditz & Emmons, 2018). Further, publishing implementation and evaluation studies is important to contribute to the collective evidence base and reduce research waste by sharing what works and what did not (Wolfenden et al., 2015). This gap in the broader transfusion medicine literature has been identified previously by Lorencatto et al. (2014) who called for more evidence-based implementation in transfusion medicine through the use of multidisciplinary collaboration and

implementation science theories, models, and frameworks. The use of theory in KT increases the likelihood of implementation success (Eccles et al., 2005; Michie et al., 2005; Nilsen, 2015). People working in transfusion medicine could look for guidance in general KT papers providing an overview of theories, such as Damschroder (2020), Nilsen (2015) or Lynch et al. (2018). Further, papers have been published recently in transfusion medicine journals describing specific KT frameworks, such as the Knowledge to Action framework (Solh et al., 2018), Intervention Mapping (Thijsen, Waller, et al., 2021), or a broader implementation science-informed approach to improve the uptake of clinical guidelines (Crawshaw et al., 2025).

It is important to acknowledge that this review was limited to one specific topic and that the field of transfusion medicine is diverse and includes other areas with potential for KT. Future research could investigate the capacity for KT in transfusion medicine by examining what knowledge is available for translation in other key areas such as blood donor iron health or storage of platelets. This review, however, does indicate that the vasovagal reaction field is in the early stages of KT due to the relative recency of the published research, the limited evidence on effective interventions, and the few papers describing and assessing implementation and evaluation.

6.2 End-user engagement

As discussed in the Introduction (**Chapter 1**), KT can also be encouraged through end-user engagement in the research process. Shared decision making by researchers and end-users in the design, execution and interpretation of the research ensures that the knowledge generated meets the needs of end-users and increases its potential for translation (Boaz et al., 2015; Bombard et al., 2018; Goodman & Sanders Thompson, 2017; Pellecchia et al., 2022; Sprague Martinez et al., 2018). Understanding how researchers can best engage with end-users and how end-users interact with researchers is key to strengthening KT in transfusion medicine.

How end-users are engaged in the research process can vary. As outlined in **Chapter 1**, end-user engagement can range from non-participation (e.g., outreach and education) to symbolic participation (e.g., coordination and cooperation) to engaged participation (e.g., collaboration, patient-centred and community-based participatory research) (Goodman & Sanders Thompson, 2017).

In an international survey with transfusion medicine researchers (**Chapter 4**), I found that most researchers reported having engaged end-users to some extent in their research. When comparing self-reported engagement along the stakeholder engagement continuum by Goodman and Sanders Thompson (2017), I observed that most surveyed researchers primarily reported non-participation and symbolic participation, with fewer researchers reporting engaged participation. For example, the most frequently reported type of engagement was informing end-users of their research (63%), which is classified as non-participation due to its unidirectional sharing of knowledge. This type of engagement is known to be less conducive to KT than other types (Boaz et al., 2015; Bombard et al., 2018; Goodman & Sanders Thompson, 2017).

Further, only 28% of surveyed researchers reported partnering with end-users throughout the research where decision-making was shared by both researchers and end-users, and only 17% reported conducting research initiated by end-users (both activities fall within the highest category of engaged participation). Importantly, less than half of our survey respondents who reported engaging end-users in their research at some point in their careers had engaged end-users in setting research priorities, interpreting results, or selecting research translation products (Thijsen et al., 2024). These findings may indicate that meaningful end-user engagement with shared decision-making – spanning from the initial stages of the research to interpretation and translation – is currently limited in transfusion medicine.

The low proportion of transfusion medicine researchers reporting engaged participation may be explained by their self-reported barriers to KT (**Chapter 3**), with a quarter of surveyed researchers indicating not knowing how to contact end-users. Further, a third of researchers expressed concerns about their research findings not being applied or translated correctly and 23% felt that end-users did

not understand their research. These are important barriers to consider when developing supports for researchers to engage end-users in their research. A potential strategy to encourage end-user engagement is the establishment of knowledge brokers to support researchers. Knowledge brokers, a dedicated role or team, create networks and build relationships between researchers and end-users to share knowledge, understand each other's needs and priorities, and facilitate the use of research evidence in policy and practice. The success of knowledge brokers in translating knowledge to policy and practice has been demonstrated in other areas (Dobbins et al., 2009; Elueze, 2015; Thompson & Schwartz Barcott, 2019) and may provide an opportunity to strengthen the process of KT in transfusion medicine.

The effects of this limited end-user engagement were also observed in the interviews I conducted with end-users working in a blood collection department in a single organisation (**Chapter 5**). Most of the participants reported passive experiences with research, where they were informed of research through plain language summaries or hearing about research activities and/or findings in meetings with researchers from their organisation. A few participants shared experiences of symbolic participation by providing advice on certain aspects of the research or coordinating the collection of additional blood samples for research. Further, two senior managers reported that they had engaged researchers to design and conduct surveys, as well as analyse routinely collected data. This may reflect some degree of engaged participation occurring within the department. Other senior managers, however, expressed a lack of motivation within the department to commission research. They suggested that, to overcome this barrier, someone needed to champion research within the department and broader organisation. Champions are people with access to senior management and influence within the organisation who can advocate for research and help secure resources. The effectiveness of champions has been seen in other areas beyond transfusion medicine including implementing and sustaining health-related programs (Miech et al., 2018; Scheirer, 2005).

To increase the capacity for KT in transfusion medicine, building strong relationships between researchers and end-users needs to be a key priority. Future research could focus on understanding how

and the extent to which end-users want and can be engaged in transfusion medicine research. Jull et al. (2019) proposed that, rather than dictating when and how end-users are engaged in research, a partnered negotiation occurs between researchers and end-users throughout the research process to determine who should be meaningfully engaged and in what manner. They also emphasise that every relationship between researchers and end-users is unique, due to differences in knowledge, needs, and skills of the individuals and their context. This exploration into end-user engagement can, however, be guided by existing frameworks on end-user engagement (Bombard et al., 2018; Boyer et al., 2018; Jull et al., 2019).

6.3 Dissemination

Another key aspect of KT focuses on how research knowledge is shared with end-users. As outlined in the Introduction (**Chapter 1**), knowledge that is easy to understand, well-presented and readily available has greater potential for translation, with tailored dissemination methods having greater impact than broader diffusion methods (Chapman et al., 2021; Contandriopoulos et al., 2010; Oliver et al., 2014; Wilson et al., 2010). As part of my thesis, I therefore investigated how researchers commonly share their research knowledge and how end-users prefer to receive research knowledge to identify opportunities to strengthen this aspect of KT.

In **Chapter 4**, I presented the findings of a survey with an international sample of researchers working in transfusion medicine. I found that respondents predominately reported the use of traditional dissemination strategies by sharing their knowledge through publishing in peer-reviewed journals and presenting at academic conferences. To a lesser extent, researchers made their findings available through plain language summaries, inclusion in new educational materials, and presenting the findings in small interactive meetings (Thijsen et al., 2024). This apparent preference for using traditional diffusion strategies is likely driven by the fact that the performance of researchers is typically measured by the number of peer-reviewed publications and grant funding bodies have traditionally focused on academic publications (Happell & Cleary, 2014; Newton et al., 2007; Tabak et al., 2015). Funders and

organisations can play an important role in encouraging and supporting researchers to use dissemination strategies and strengthen KT. Funders and organisations can encourage KT, for example, by requiring a dissemination plan together with grant applications, funding KT activities, needing active involvement of end-users in the research, and advocating for KT (Brantnell et al., 2015; Holmes et al., 2012; Lavis et al., 2003; Shahid et al., 2025). Further, funders and organisations can require the use of tailored dissemination strategies with actionable insights, provide opportunities for researchers to build skills and time to create dissemination strategies, and acknowledge dissemination efforts in promotion and grant applications (Lavis et al., 2003).

This disconnect between how researchers predominantly share their knowledge and how end-users engage with research knowledge was also evident in the research reported in **Chapter 5** of this thesis where I interviewed potential knowledge end-users working in blood collection. End-users described difficulties understanding research papers and preferring easy-to-understand documents that can be interpreted without the need for clinical or scientific expertise. They also described not knowing where to find research knowledge indicating limited accessibility of knowledge which, in turn, reduces its potential for translation. On the other hand, a few end-users spoke about smaller interactive meetings with researchers being effective in increasing their understanding of what research is being conducted and knowing who to ask for more information about certain topics. These experiences supports the evidence of tailored dissemination methods being more effective in KT than traditional dissemination strategies as reported in the broader literature (Chapman et al., 2021; Contandriopoulos et al., 2010; Oliver et al., 2014; Wilson et al., 2010).

Whilst these findings largely align with those found in the mainstream KT literature, additional research is needed to better understand the effectiveness of tailored dissemination of research findings on KT in transfusion medicine. We currently do not know how effective these strategies actually are in increasing end-user knowledge, or their perceived usefulness or impact on use of research knowledge in blood transfusion policy and practice. Future research could look at assessing the effectiveness of various dissemination strategies within transfusion medicine and could be guided by theoretical frameworks

and specific tools from the broader field of dissemination research (Baumann et al., 2022; Chapman et al., 2021). For example, studies have used Roger's Diffusion of Innovations (Rogers et al., 2019), the Knowledge to Action Framework (Graham et al., 2006), or the RE-AIM framework (Glasgow et al., 1999) to guide their evaluation of dissemination strategies (Baumann et al., 2022). Future research could assess the impact of various strategies, such as tailored and targeted messages shared in written, diagram or video format, on changing knowledge, awareness, intentions to use or apply research evidence, use of research evidence, and decision-making practices of their target audience (Chapman et al., 2021). In addition, end-users could be upskilled to be able to critically appraise and apply research evidence to their work. There is evidence from other fields of research that staff training can be an effective strategy to increase end-user confidence in using research (Haynes et al., 2018; King et al., 2024; Peirson et al., 2012).

6.4 Organisational factors

Finally, the ability of researchers and end-users to practice KT is influenced by the organisational context that they work in, as outlined in the Introduction (**Chapter 1**). Researchers and end-users are reliant on organisational systems or technical infrastructure to share and access research evidence, support from leadership, the provision of resources and funding for KT, and having an organisational culture that is conducive to research evidence use. To build KT capacity within transfusion medicine, it is important to gain an understanding of the organisational factors that influence KT experiences of researchers and end-users.

In the interviews with end-users working in a blood collection department in a single organisation (**Chapter 5**), I found that senior managers engaged with research through committees with researchers present, webinars hosted by researchers, ad hoc meetings with researchers, and receiving written research communications. Frontline staff and middle managers, however, described a lack of formal structures to engage with research. Further, many of the interviewed end-users were unsure of who to contact about research evidence and there was limited engagement with the internal library service

reported by participants. Whilst senior managers described using research evidence to support policy and practice changes, to provide insights into issues the organisation is facing, or even directly informing changes to donor selection criteria, this process was often not visible to middle managers and frontline staff. This lack of visibility and access to research evidence, in turn, has the potential to negatively influence the perception of middle managers and frontline staff of the organisation's value of, and culture around, using research evidence. The frontline staff interviewed felt it was important to know the evidence behind current policies and practice guidelines to boost confidence in their delivery of services and care as well as to motivate adoption of policy and practice changes. All participants, however, mentioned constraints in their ability to engage with research due to work commitments and lack of allocated time for research engagement activities.

Similar organisational barriers were also found in the survey with researchers (**Chapter 3**). Having too many competing priorities, not having the time, and not having enough funds or resources were the most frequently endorsed barriers to practising KT. Perhaps the most striking finding was that a quarter of researcher respondents did not feel supported by their organisation to translate their research. Further, 20% of surveyed researchers did not know who was responsible for translating their research. Respondents also commented that there were no organisational structures, roles or incentives in place to facilitate KT.

Taken together, these insights from end-users and researchers suggest that many of the difficulties experienced when translating or attempting to translate research knowledge relate to the organisational context. Therefore, efforts to strengthen KT should focus on enhancing organisations' capacity as well as individual capabilities to engage with research.

Future research could focus on designing, implementing, and evaluating an intervention within blood collection agencies to build KT capacity. Recent reviews of programmes focused on strengthening organisational KT capacity and individual KT capabilities may provide useful guidance (Haynes et al., 2018; King et al., 2024; Slade et al., 2018). A recent review of the literature on models and approaches

to build capacity and capability for KT in health services found that most programs include a combination of strategies such as education, establishing dedicated implementation support roles, strategic research-practice partnerships and collaborations, and dedicated funding for KT (King et al., 2024). Another review of frameworks and models for embedding a research culture in allied health practice described the importance of strong leadership and management support, providing infrastructure, systems and processes to promote and support research engagement and use, and upskilling of end-users (Slade et al., 2018). To guide the selection of strategies, researchers could look to published studies describing multifaceted, highly-tailored approaches co-created with end-users (Armstrong et al., 2013; Peirson et al., 2012; Williamson et al., 2019). In addition, it is also important to assess the effectiveness of these interventions to understand what elements are effective and why. Researchers could use existing tools to measure changes in end-user research engagement activities, such as the SEER (Seeking, Engaging with and Evaluating Research) questionnaire (Brennan et al., 2017), and to capture changes in organisational capacity for research engagement, such as the ORACLe (Organisational Research Access, Culture, and Leadership) questionnaire (Makkar et al., 2016).

6.5 Limitations

It is important to note the limitations of this work. The literature review (**Chapter 2**) focused on one specific area of transfusion medicine and other areas within transfusion medicine may have progressed further along the research-to-practice trajectory. Further, grey literature, such as unpublished detailed reports and webpages, was excluded from the review. Knowledge synthesis, tools and products, implementation and evaluation efforts may have been described in the grey literature. There is also a potential for bias in the survey study (**Chapters 3 and 4**), which limits the conclusions drawn from this work. Researchers who were more interested in KT may have opted to participate in this survey to a greater extent than those with no interest (i.e., selection bias). Further, the reliance on self-reported data may have inflated the positive responses to KT and greater use of end-user engagement and KT activities due to social desirability bias and recall bias. Future research could look at examining actual use of end-user engagement and KT activities such as examining for each project at which points end-

users were engaged with the research. Finally, the interview study (**Chapter 5**) was conducted with participants from one department within a single blood collection agency. Whilst this allowed for an in-depth examination of their engagement with research, more research is needed to understand whether these experiences of end-users are found more broadly across blood collection agencies.

6.6 Conclusion

In conclusion, this thesis has advanced our understanding of KT in transfusion medicine. This is the first program of work to explore, in-depth, the extent of KT in transfusion medicine. This work highlighted the significance of having reliable, robust and actionable research evidence that meets the needs of knowledge end-users and fits within the organisational context. Importantly, it shows the need for meaningful engagement of end-users and the establishment of organisational structures and climate to support research engagement. These factors – research knowledge, knowledge producers and end-users, and contextual factors – are interrelated and need to be addressed collectively to advance KT. This thesis has laid the groundwork for continued investigations into KT in transfusion medicine, and it is hoped that the insights presented here will inform future investigations and practical applications of the findings in meaningful ways.

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Appendix

List of appendices

Appendix One

Ethics approvals

Tuesday, 1 February 2022

Dr Anna Williamson
School of Public Health: Public Health; Faculty of Medicine and Health
Email: anna.williamson@sydney.edu.au

Dear Anna,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	**2021/854**
Project Title:	**Examining knowledge translation among researchers, policy-makers and practitioners working in the area of transfusion medicine: an international survey study**
Authorised Personnel:	**Williamson Anna; Thijsen Amanda; Masser Barbara; Davison Tanya E.;**
Approval Period:	**01/02/2022 to 01/02/2026**
First Annual Report Due:	**01/02/2023**

Documents Approved:

Date Uploaded	Version Number	Document Name
05/12/2021	Version 2	Email Invitation Version 2 (Clean)
05/12/2021	Version 1	Email Reminder Version 1
05/12/2021	Version 2	Study Protocol Version 2 (Clean)
25/09/2021	Version 1	Participant Information Statement
25/09/2021	Version 1	Recruitment Newsletter
25/09/2021	Version 1	Recruitment Social Media Post

Special Condition/s of Approval

It is a condition of approval that a letter of agreement/permission is obtained from all professional organisations to distribute the invitation via their organisations and kept on file as part of your records prior to the relevant part of this research commencing. You do not need to provide a copy to the Ethics Office.

Please note that if a potential participant were to unsubscribe ("If you do not wish to receive any future emails about this study you can unsubscribe here {insert link to opt out survey}."), they may still receive invitation emails forwarded to them as part of the passive snowball strategy employed.

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.

- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

[redacted]

Professor Michael Skilton
Chair
Health Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Monday, 22 June 2020

Dr Anna Williamson
School of Public Health: Public Health; Faculty of Medicine and Health
Email: anna.williamson@saxinstitute.org.au

Dear Anna,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	**2020/254**
Project Title:	**What drives change in clinical practice? A qualitative study with frontline staff, middle-managers, and executive leaders at Australian Red Cross Lifeblood**
Authorised Personnel:	**Williamson Anna; Thijsen Amanda; Masser Barbara; Davison Tanya;**
Approval Period:	**22 June 2020 to 22 June 2024**
First Annual Report Due:	**22 June 2021**

Documents Approved:

Date Uploaded	Version Number	Document Name
15/06/2020	Version 1.2	Updated Study Protocol
12/05/2020	Version 1	Telephone script (new)
12/05/2020	Version 1.2	Recruitment email final version
12/05/2020	Version 1.1	Participant information statement final version
08/04/2020	Version 1	Questionnaire
08/04/2020	Version 1	Interview Guide
07/04/2020	Version 1	PIS
07/04/2020	Version 1	PCF

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).

- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

Associate Professor Michael Skilton
Chair, Health Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Australian Red Cross Lifeblood

1 July 2020

Amanda Thijsen
Senior Research Assistant
Australian Red Cross Lifeblood
17 O'Riordan Street
Alexandria NSW 2015

Dear Amanda,

Reference number: 2020#14

Project title: What drives change in clinical practice? A qualitative study with frontline staff, middle-managers, and executive leaders at Australian Red Cross Lifeblood

Thank you for submitting this project to the Australian Red Cross Lifeblood Ethics Committee for expedited review. Your project, listed above, was considered by the Chair on behalf of the Ethics Committee. I am pleased to advise that the Chair has granted ethical approval of this submission for an initial period of three years, from 1 July 2020 to 1 July 2023, subject to the following conditions being met:

- The Principal Investigator will immediately report anything that might warrant review of ethical approval of the project.
- The Principal Investigator will seek approval from the Lifeblood Ethics Committee for any proposed changes to the protocol, including changes to the investigators and changes to the approved documents. An approval letter must be received before the amendment is implemented.
- The Principal Investigator will report to the Lifeblood Ethics Committee annually and notify the Ethics Committee when the project is completed.
- The Principal Investigator will notify the Lifeblood Ethics Committee of any plan to extend the duration of the project past the approval period listed above, and submit any associated required documentation.

The approved documents include:

Document	Version	Date
Protocol	1.2	15 June 2020

If you require any further information, please contact the Ethics Secretary on 02 9234 2368 or at ethics@redcrossblood.org.au.

Yours sincerely,

[redacted]

Dr Larissa Aldridge
Ethics Secretary

The Lifeblood Ethics Committee is constituted and operates in accordance with the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research* (2007).

Appendix Two

Study two materials

Participant Information Statement

Research Study: Examining knowledge translation among researchers, policy-makers and practitioners working in the area of transfusion medicine: an international survey study

Dr Anna Williamson (Responsible Researcher)
School of Public Health
Phone: +61 2 9188 9500 | Email: anna.williamson@saxinstitute.org.au
Amanda Thijsen (PhD student) | Email: athi7791@uni.sydney.edu.au

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1. What is this study about?

We are conducting a research study about exploring the perceptions, attitudes and practices of researchers, policy-makers and practitioners towards knowledge translation in transfusion medicine. Taking part in this study is voluntary.

Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

2. Who is running the study?

The study is being carried out by the following researchers:

- Amanda Thijsen, PhD Student, The University of Sydney
- Dr Anna Williamson, Research Fellow, The University of Sydney
- Prof Barbara Masser, ARCBS Chair of Donor Research, The University of Queensland
- A/Prof Tanya Davison, Director, Research Discovery, Silver Chain Group

Amanda Thijsen is conducting this study as the basis for the degree of Doctor of Philosophy at The University of Sydney.

3. Who can take part in the study?

We are seeking researchers, policy-makers and practitioners working in the field of transfusion medicine. We would like to invite those who do and those who do not have experience with translating research evidence into policy and/or practice.

You have been invited to take part in this study because you have either attended a recent transfusion medicine related conference, are part of the BEST collaborative, have recently published in a transfusion medicine journal, or applied for a grant to conduct research relating to transfusion medicine. Alternatively, a colleague may have forwarded you the survey invitation.

4. What will the study involve for me?

If you decide to take part in this study, you will be asked to complete an online, anonymous survey about translating research evidence into policy or practice in transfusion medicine. The survey will take approximately 10 minutes.

5. Can I withdraw once I've started?

Being in this study is completely voluntary and you do not have to take part.

Your decision will not affect your current or future relationship with the researchers or anyone else at The University of Sydney.

By submitting your survey, you consent to take part in the study. You can withdraw any time before you submit however once your responses are submitted, they cannot be withdrawn. This is because they are anonymous, and we will not be able to tell which one yours is.

6. Are there any risks or costs?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study.

7. Are there any benefits?

You will not receive any direct benefits from being in the study.

8. What will happen to information that is collected?

By providing your consent, you are agreeing to us collecting information about you for the purposes of this study.

Any information you provide us will be stored securely and we will only disclose it with your permission, unless we are required by law to release information. We are planning for the study findings to be published as part of a PhD thesis and as a journal article. You will not be individually identifiable in these publications.

9. Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. At the end of the survey you will be asked if you would like to receive a copy of a brief lay summary of our main findings. If you agree, you will be redirected to another survey to enter your email address which will be stored separately from your initial survey responses.

10. What if I would like further information?

When you have read this information, the following researcher/s will be available to discuss it with you further and answer any questions you may have:

Amanda Thijsen, PhD student
athi7791@uni.sydney.edu.au

11. What if I have a complaint or any concerns?

The ethical aspects of this study have been approved by the Human Research Ethics Committee (HREC) of The University of Sydney [2021/854] according to the *National Statement on Ethical Conduct in Human Research (2007).*

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University:

Human Ethics Manager
human.ethics@sydney.edu.au
+61 2 8627 8176

Email Survey Invitation Template

Study	Examining knowledge translation among researchers, policy-makers and practitioners working in the area of transfusion medicine: an international survey study
Version	Version 2 21.11.2021
Subject	Please help with important research

Dear researcher, practitioner and/or policy-maker,

We would like to hear about your experiences of translating research evidence into policy or practice in transfusion medicine and invite you to take part in a survey. We would like to learn about the experiences of researchers as well as policy-makers and practitioners working in this field.

Study aims

By taking part in this survey, you'll help us gain a better understanding of how research evidence is currently being disseminated, accessed, and used in transfusion medicine. We are also interested in how you work with researchers, policy-makers and practitioners. Even if you don't use research evidence, we are interested to hear your thoughts.

This survey:

- takes approximately 10 minutes
- is completely voluntary
- will be open until 31 May 2022, and
- is anonymous.

You can find more detailed information about the study in our Participant Information Statement https://redcap.sydney.edu.au/surveys/?s=KCH4Y897HJ4AHXJL.

Take Survey

Please use this link to access the survey:
https://redcap.sydney.edu.au/surveys/?s=L4FPNDLRA99FNMD4

If you have any questions about this study, please reply to this email or contact Amanda Thijsen at athi7791@uni.sydney.edu.au.

Invite your colleagues

We would like to hear from as many people as possible working in the field of transfusion medicine. Please forward this invitation email to your colleagues working as a researcher, policy-maker or practitioner who might be interested in participating.

Thank you for taking time to help.

Yours sincerely,

Amanda Thijsen, The University of Sydney
Dr Anna Williamson, The University of Sydney
Prof Barbara Masser, The University of Queensland
A/Prof Tanya Davison, Silver Chain Group

Email Survey Reminder Template

Study	Examining knowledge translation among researchers, policy-makers and practitioners working in the area of transfusion medicine: an international survey study
Version	Version 1 21.11.2021
Subject	A reminder to help with important research relating to Transfusion Medicine

Dear researcher, practitioner and/or policy-maker,

This is a friendly reminder that our survey about translating research evidence in transfusion medicine is still open. We would love to hear about your experiences as a researcher, policy-maker or practitioner working in this field.

Take Survey
Please use this link to access the survey:
https://redcap.sydney.edu.au/surveys/?s=L4FPNDLRA99FNMD4

Study aims
By taking part in this survey, you'll help us gain a better understanding of how research evidence is currently being disseminated, accessed, and used in transfusion medicine. We are also interested in how you work with researchers, policy-makers and practitioners. Even if you don't use research evidence, we are interested to hear your thoughts.

This survey:

- takes approximately 10 minutes
- is completely voluntary
- will be open until 31 May 2022, and
- is anonymous.

You can find more detailed information about the study in our Participant Information Statement https://redcap.sydney.edu.au/surveys/?s=KCH4Y897HJ4AHXJL.

If you have any questions about this study, please reply to this email or contact Amanda Thijsen at athi7791@uni.sydney.edu.au.

Invite your colleagues
We would like to hear from as many people as possible working in the field of transfusion medicine. Please forward this invitation email to your colleagues working as a researcher, policy-maker or practitioner who might be interested in participating.

Thank you for taking time to help.

Yours sincerely,

Amanda Thijsen, The University of Sydney
Dr Anna Williamson, The University of Sydney
Prof Barbara Masser, The University of Queensland
A/Prof Tanya Davison, Silver Chain Group

Social Media Study Invitation Template

Study	Examining knowledge translation among researchers, policy-makers and practitioners working in the area of transfusion medicine: an international survey study
Version	Version 1 07.08.2021

Do you work in transfusion medicine as a researcher or practitioner? We'd love to hear your thoughts on the use of research evidence in #blooddonation policy and practice. Please help by completing a short survey: *{insert survey link}* Thank you!

Do you work in #transfusion medicine? We'd love to hear your thoughts on using research evidence in #blooddonation policy and practice. Please help by completing a short survey: https://redcap.sydney.edu.au/surveys/?s=L4FPNDLRA99FNMD4 Thank you!

Just a quick reminder to take our survey on translating and using research evidence in #transfusionmedicine. If you've already replied to the survey, thank you so much for your time and sharing! https://redcap.sydney.edu.au/surveys/?s=L4FPNDLRA99FNMD4

@aabb @isbtco @transfusionlib @transfusionnews @lifebloodRnD @EUBloodAlliance

LinkedIn:

Do you work in transfusion medicine?

Are you from a blood collection agency, a university, a research institute, or another health service working with blood or blood donors?

Could you please help by completing an anonymous survey that asks you about how research evidence is translated into blood donation policy and practice?

We'd like to hear about the experiences of researchers as well as policy-makers and practitioners working in transfusion medicine.

START SURVEY: https://redcap.sydney.edu.au/surveys/?s=L4FPNDLRA99FNMD4

Please share!! We'd like to hear from as many people as possible working in the field of transfusion medicine.

#research #transfusionmedicine #blooddonation #knowledgetranslation

Knowledge Translation in Transfusion Medicine

Thank you in advance for completing this survey about your opinions and experience of translating research in transfusion medicine. The survey will ask you about research translation activities as well as professional demographics.

The study is being carried out by Amanda Thijsen, Dr Anna Williamson, Prof Barbara Masser and A/Prof Tanya Davison. Amanda Thijsen is conducting this study as the basis for the degree of Doctor of Philosophy at The University of Sydney. This will take place under the supervision of Dr Anna Williamson.

Completion of this questionnaire is voluntary. Please answer questions as well as you can. There are no right or wrong answer and all your responses will be collected anonymously and treated as confidential.

A copy of the full participant information statement can be viewed here: {insert link}

BLOCK: Screening

What proportion of your working time do you spend conducting research?

Research activities: __%

What proportion of your working time do you spend working in transfusion policy and/or practice?

Transfusion policy and/or practice: __%

[*If Research Activities = 100%, then move to Questionnaire Part A – Research producer*]
[*If Research Activities = 0%, then move to Questionnaire Part B – Research user*]
[*If Research Activities > 0% & <100%, then move to Questionnaire Part C – Combined role*]

PART A: RESEARCH PRODUCER

BLOCK: Demographics

Directions: These first set of questions will ask about your demographic and professional background.

In which country are you based? _____

How do you describe your gender?

- Man/Male
- Woman/Female
- Non-binary
- I use a different term
- Prefer not to say

[*If selected "I use a different term"*] Please write how you would prefer to be identified: _____

What is the highest level of education that you have completed? (If currently enrolled, highest degree received)

- Secondary school or less
- Advanced diploma/diploma
- Bachelor degree (including honour degrees)
- Postgraduate degree (masters or PhD)

Which best describes the setting in which you primarily work?

- University
- Research institute (not within a university)
- Government department or agency
- Blood collection agency
- Hospital setting
- Healthcare service (not a blood collection agency or hospital)
- Other, please specify: _____

Do you also currently work in any of the other settings?

- Yes, namely [*insert dropdown with previous question options*]
- No

Which best describes your main research focus?

- Blood components
- Blood donation
- Blood transfusion
- Cellular therapy and tissue banking

- Immunohematology and blood genomics
- Patient blood management
- Transfusion complications
- Transfusion-transmitted diseases
- Other, namely: _____

What type of research methodology are you currently using? (please select all that apply)

- Animal studies
- Biospecimen analysis research
- Data linkage research
- Epidemiological research
- Interventional/Clinical trials research
- Qualitative research
- Quantitative research
- Other: _____

How many years have you worked within the area of transfusion medicine? ____

Have you ever received training on translating research into policy and/or practice (i.e. knowledge translation)?

- Yes
- No
- Unsure/Don't know

BLOCK: Knowledge Translation activities *(based on Canadian Institutes of Health Research, 2012)*

Directions: These next set of questions will ask you about any activities you may undertake to share your research findings, and the possible response categories range from *never* to *always*. When answering these questions, please keep in mind that how often you undertook each activity may depend on how often it was feasible for you to do so, given the nature of the activity and the context in which you work.

- If you undertook a particular activity whenever it was feasible to do so, please indicate:
  - *always* if you undertook the activity every single time it was feasible or
  - *frequently* if you did so almost every single time it was feasible.
- If you undertook a particular activity at least once but much less often than it was feasible to do so, please indicate:
  - *occasionally* if you undertook the activity more often than not or
  - *rarely* if you hardly ever did so.
- If you never undertook a particular activity whether it was feasible to do so or not, please indicate *never*.

Diffusion activities

To what extent do you do the following activities to disseminate your research findings? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently, 5=Always)

- Publishing in peer reviewed journals
- Presenting at an academic conference
- Detailed research reports

Dissemination activities

To what extent do you do the following activities to disseminate your research findings? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently, 5=Always)

- Developing new educational materials/sessions
- Organising interactive small group meeting/workshop
- Writing plain language summaries
- Preparing policy or evidence brief and disseminating them to relevant audiences (e.g., policy-makers, health service providers or administrators)
- Engaging with social media (e.g. Facebook, Twitter)
- Organising a media release/outreach campaign
- Creating networks or networking with end-users such as policy-makers and practitioners (e.g., give presentations to relevant networks)
- Engage champions or opinion leaders (e.g. directors, managers) to assist with sharing of research findings

BLOCK: User engagement *(based on Crockett et al., 2019)*

Directions: This section asks about your knowledge and experience with engaging potential end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) in research.

At what level have you engaged end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) in your research? *[multiple choice]*

- Letting them know about your research findings.
- Obtaining their feedback or input in any component of research.
- Working directly with end-users throughout the research process to ensure that concerns and aspirations are consistently understood and considered to the maximum extent possible.
- Partnering with end-users (i.e. shared decision-making) in each aspect of the research process.
- End-user initiated research.
- I have not engaged end-users in my research. *[exclusive option]*

[*If selected "Letting them know about your research findings"*] How did you let them know about your research findings? [*multiple choice*]

- Sent them my research papers
- Sent them evidence briefs or plain language summaries
- Presented my research to them
- Held meetings, roundtables or forums to discuss my research

[If selected "I have not engaged end-users in my research" > skip to next block]

Who have you engaged in the research process? Please select all that apply:

- Blood donors
- Blood recipients
- Blood collection staff
- Blood processing staff
- Senior management
- Policy makers
- Hospital staff
- General public
- Other, namely: _____

There are different points in the research process where end-users (e.g., policy makers, blood processing staff, hospitals, blood donors, blood recipients) could potentially be engaged. Please indicate those research phases where you have experience engaging with end-users. Please select all that apply:

- Research priority-setting
- Grant proposal/protocol writing
- Input into methodology/study design
- Development of research questions
- Data collection
- Data analysis
- Interpretation of results
- Input into the selection of research translation products
- Evaluation of research processes
- Determining future research priorities stemming from the results
- Other, please specify….

BLOCK: Importance and responsibility for KT *(based on Lynch et al., 2018)*

Directions: We would like to know more about your views on who should be responsible for and the importance of translating research into policy and/or practice.

Please rate your agreement with the following statements: (1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree)

1. It is important to me that my research is translated.
2. My research is not the sort of research that can be translated.

3. It is my responsibility to ensure that my research is translated.
4. Research translation is the responsibility of someone else in my team
5. Stakeholders should be responsible for translating findings into practice.
6. I know which strategies should be used (by myself/others) to translate my research.
7. I have the skills to ensure my research is translated.
8. There is adequate funding available to support translation of my research.
9. Spending time on translating my research would take me away from research I enjoy.
10. Researchers with experience/interest in implementation should translate my research.
11. Every research team should include a researcher with expertise in implementation.

BLOCK: Barriers to and facilitators of KT *(based on Sibley et al., 2017)*

Directions: For the next set of questions, we would like to know more about some of the barriers you may face and facilitators that support your translation practices.

Barriers to KT

What barriers have you faced when translating or attempting to translate your research findings? Please rate your agreement with the following statements: (1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree)

Systemic/organisational barriers

1. I don't have enough funds or resources to translate my research
2. I don't feel supported by my organisation/institution to translate my research
3. I don't have the time to translate my research
4. I have too many competing priorities to translate my research
5. I don't know how to make contact with end-users (e.g., policy-makers, practitioners)

Individual barriers

6. I am worried that my research findings will not be applied or translated correctly
7. I don't have the skills or ability to translate research
8. I don't have any interest in translating research
9. Translating research is not relevant to my research
10. Translating research is not beneficial for my career
11. I don't know who is responsible for translating research

Logistical barriers

12. I experienced difficulties translating a very large body of evidence
13. I experienced physical barriers when working with rural or remote groups
14. I experienced difficulties translating research because of the current emphasis on training academics to conduct but not translate research
15. I have concerns regarding intellectual property and commercialisation
16. End-users (e.g., policy-makers, practitioners) do not understand the research

Are there any other factors that hindered you to translate your research?

Facilitators of KT

What factors have you found support the process of translating research findings? Please select all that apply

1. Maintaining good relationships with end-users (e.g., policy-makers, practitioners)
2. Clear roles in translating research
3. The ability to access resources for research translation such as funding and personnel
4. Experience and training in practising knowledge translation
5. Personal traits including drive, passion and enthusiasm
6. Trained communications personnel working on or alongside my team
7. End-users (e.g., policy-makers, practitioners) valuing research
8. None of the above [exclusive answer]
9. 9. I have not tried to translate research

Are there any other factors that helped to translate your research?

Researcher needs for practising KT

What could be done to better support your engagement in practising research translation? [multiple choice]

- Access to education and training
- Access to resources to increase awareness, promotion and discussion of knowledge translation
- Opportunities to collaborate through facilitated networks
- Recognition for knowledge translation efforts in promotion and tenure consideration
- More protected time to practice knowledge translation
- I don't need any support to translate my research [exclusive answer] [*skip next question*]

What else could be done to better support you?

BLOCK: COVID-19 Effects

The effects of the current COVID-19 pandemic are far reaching. We would like to gain an understanding of how the pandemic may have affected research translation activities.

What do you think are the main effects of COVID-19 on the translation of research evidence to policy and practice in the field of transfusion medicine? (rated 1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree).

- Translating research evidence that is less relevant to the current pandemic is being put on hold.
- Research evidence relating to COVID-19 is more rapidly translated into policy and/or routine practice.
- Research not relating to COVID-19 is being put on hold.
- There has been more research initiated by end-users to support policy and practice changes with regards to the pandemic.
- I work more closely with end-users to provide research evidence to support policy and practice changes.
- Research evidence is more valued by end-users (e.g., policy-makers, practitioners).
- There is less funding available to conduct or translate research.
- It is harder for me to share my research findings with end-users (e.g., lack of events or workshops).
- Policy-makers and practitioners are too busy dealing with the effects of the COVID-19 pandemic to make time to interact with researchers.

Are there any other effects of the COVID-19 pandemic on the translation of research findings into policy and practice in transfusion medicine?

[MOVE TO SURVEY END]

PART B: RESEARCH USER

BLOCK: Demographics

Directions: These first set of questions will ask about your demographic and professional background.

In which country are you based? _____

How do you describe your gender?

- Man/Male
- Woman/Female
- Non-binary
- I use a different term
- Prefer not to say

[*If selected "I use a different term"*] Please write how you would prefer to be identified: _____

What is the highest level of education that you have completed? (If currently enrolled, highest degree received)

- Secondary school or less
- Advanced diploma/diploma
- Bachelor degree (including honour degrees)
- Postgraduate degree (masters or PhD)

Which best describes the setting in which you work?

- Government department or agency
- Blood collection agency
- Hospital setting
- Healthcare service (not a blood collection agency or hospital)
- Other, please specify: _____

How much influence does your position have to make changes to policy or practice?

- A lot
- Some
- Very little
- None at all

What best describes the area of your work?

- Blood collection
- Manufacturing
- Policy making
- Transfusion

- Other, namely: _____

How many years have you worked within the area of transfusion medicine? ____

Have you ever received training on translating research into policy and/or practice (i.e. knowledge translation)?

- Yes
- No
- Unsure/Don't know

BLOCK: Knowledge Translation activities *(based on (Canadian Institutes of Health Research, 2012)*

Directions: These next set of questions will ask you about how often you have received information about research findings and in what format.

To what extent have you received from researchers the following materials or invitations to participate in activities? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently)

- Published research articles
- A copy of presentations from academic conferences
- Detailed research reports
- New educational materials/sessions informed by research evidence
- An invitation to attend events and courses (e.g. conference, symposium, continuing medical education)An invitation to attend an interactive small group meeting/workshop
- Plain language summaries of research findings
- A social media post about research findings (e.g., Facebook, Twitter)
- An invitation to attend a presentation on research findings within my organisation specifically for stakeholders like yourself
- An invitation to assist with sharing of research evidence
- A policy or evidence brief

BLOCK: Access to and use of research evidence *(adapted from (Armstrong et al., 2014)*

This section will ask you about your experiences with accessing research findings. Please rate your agreement with the following statements (1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=neither agree not disagree, 5=somewhat agree, 6=agree, 7=strongly agree).

1. It is easy for me to access the most relevant research findings.
2. It is easy to access someone who can provide help in finding, interpreting and using research findings (e.g. librarian, epidemiologist or researcher).
3. I have good access to academic literature that I need to perform my job.
4. I have good access to synthesis or collations of academic literature (e.g. systematic reviews) that I need to perform my job.

5. I don't need to access academic literature or research findings to do my job.

To what extent do you do the following activities to access research findings? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently)

- Read articles in peer reviewed journals
- Attend presentations at an academic conference
- Read detailed research reports
- Read plain language summaries of research findings
- Attend presentations by researchers within my organisation

BLOCK: User engagement *(based on (Crockett et al., 2019)*

Directions: This section will ask you about your experiences with engaging in research.

At what level have you been engaged with research?

- Being told about research findings.
- Providing feedback to researchers or input in any component of research.
- Working directly with researchers throughout the research process to ensure that my concerns and aspirations are consistently understood and considered to the maximum extent possible.
- Partnering with researchers (i.e. shared decision-making) in each aspect of the research process.
- I initiated research.
- I have not been engaged with any research.

There are different points in the research process where end-users like yourself (e.g., policy makers, blood processing staff, hospitals, donors, recipients) could potentially be engaged. Please indicate those research phases where you have experience engaging with researchers. Please select all that apply:

- Research priority-setting
- Grant proposal/protocol writing
- Input into methodology/study design
- Development of research questions
- Data collection
- Data analysis
- Interpretation of results
- Input into the selection of knowledge translation products
- Evaluation of research processes
- Determining future research priorities stemming from the results
- Other, please specify….

BLOCK: Importance of and responsibility for KT *(based on (Lynch et al., 2018)*

Directions: We would like to know more about your views on who should be responsible for, the importance of, and your skills for translating research into policy and/or practice.

Please rate your agreement with the following statements: (1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree)

1. It is important to me that research is translated.
2. The area I work in is not the sort where research can be translated.
3. It is my responsibility to ensure that research is translated.
4. Research translation is the responsibility of someone else in my team
5. Researchers should be responsible for translating research findings into practice.
6. Clinicians should be responsible for translating research findings into clinical practice.
7. I know which strategies should be used (by myself/others) to translate research.
8. I have the skills to ensure research is translated.
9. There is adequate funding available to support translation of research.
10. Spending time on translating research would take me away from my other work-related activities which I enjoy.
11. Researchers with experience/interest in implementation should translate research.

BLOCK: Barriers and facilitators of KT *(adapted from Armstrong et al 2014)*

What do you think are the main barriers to and facilitators of using research evidence in transfusion medicine? (rated 1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=neither agree not disagree, 5=somewhat agree, 6=agree, 7=strongly agree).

- Relevant evidence is available.
- Relevant evidence is sufficiently accessible.
- The evidence is understandable.
- The evidence is too uncertain to adequately inform policy and/or practice.
- There is not enough time to look for evidence.
- There is too much information to work with.
- There is not enough time to fully understand the evidence findings for my context.
- I prioritise my time to find and use evidence.
- I'd like to develop my skills further in finding, accessing and using evidence.
- Research is not relevant or important for how things are done.
- It is not clear how to apply research findings in their specific context.
- Research evidence is too academic or technical.
- Overall, I feel confident enough to use evidence.

BLOCK: COVID-19 Effects

The effects of the current COVID-19 pandemic are far reaching. We would like to gain an understanding of how the pandemic may have affected research translation activities.

What do you think are the main effects of COVID-19 on the translation of research evidence to policy and practice in the field of transfusion medicine? (rated 1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree).

- Translating research evidence that is less relevant to the current pandemic is being put on hold.
- Staying up to date on non-COVID-19 related research has become more difficult (e.g., due to time constraints).
- Staying up to date on non-COVID-19 related research is not or no longer relevant for my work.
- Research evidence relating to COVID-19 is more rapidly translated into policy and/or routine practice.
- It has become harder for me to engage with researchers.
- I work more closely with researchers to support policy and practice changes.

Are there any other effects of the COVID-19 pandemic on the translation of research findings into policy and practice in transfusion medicine?

[MOVE TO SURVEY END]

PART C: COMBINED ROLE

BLOCK: Demographics

Directions: These first set of questions will ask about your demographic and professional background.

In which country are you based? _____

How do you describe your gender?

- Man/Male
- Woman/Female
- Non-binary
- I use a different term
- Prefer not to say

[*If selected "I use a different term"*] Please write how you would prefer to be identified: _____

What is the highest level of education that you have completed? (If currently enrolled, highest degree received)

- Secondary school or less
- Advanced diploma/diploma
- Bachelor degree (including honour degrees)
- Postgraduate degree (masters or PhD)

Which best describes the setting in which you primarily work?

- University
- Research institute (not within a university)
- Government department or agency
- Blood collection agency
- Hospital setting
- Healthcare service (not a blood collection agency or hospital)
- Other, please specify: _____

Do you also currently work in any of the other settings?

- Yes, namely [*insert dropdown with previous question options*]
- No

How much influence does your position have to make changes to policy or practice?

- A lot
- Some
- Very little
- None at all

Which best describes your main research focus?

- Blood components
- Blood donation
- Blood transfusion
- Cellular therapy and tissue banking
- Immunohematology and blood genomics
- Patient blood management
- Transfusion complications
- Transfusion-transmitted diseases
- I do not conduct research
- Other, namely: _____

What type of research methodology are you currently using? (please select all that apply)

- Animal studies
- Biospecimen analysis research
- Data linkage research
- Epidemiological research
- Interventional/Clinical trials research
- Qualitative research
- Quantitative research
- I do not conduct research *[exclusive option]*
- Other

How many years have you worked within the area of transfusion medicine? ____

Have you ever received training on translating research into policy and/or practice (i.e. knowledge translation)?

- Yes
- No
- Unsure/Don't know

BLOCK: Knowledge Translation activities *(based on Canadian Institutes of Health Research, 2012)*

Directions: These next set of questions will ask you about any activities you may undertake to share your research findings, and the possible response categories range from *never* to *always*. When answering these questions, please keep in mind that how often you undertook each activity may depend on how often it was feasible for you to do so, given the nature of the activity and the context in which you work.

- If you undertook a particular activity whenever it was feasible to do so, please indicate:
  - *always* if you undertook the activity every single time it was feasible or

    - *frequently* if you did so almost every single time it was feasible.
- If you undertook a particular activity at least once but much less often than it was feasible to do so, please indicate:
    - *occasionally* if you undertook the activity more often than not or
    - *rarely* if you hardly ever did so.
- If you never undertook a particular activity whether it was feasible to do so or not, please indicate *never*.

Diffusion activities

To what extent do you do the following activities to disseminate your research findings? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently, 5=Always)

- Publishing in peer reviewed journals
- Presenting at an academic conference
- Detailed research reports

Dissemination activities

To what extent do you do the following activities to disseminate your research findings? (1=Never, 2=Rarely, 3=Occasionally, 4=Frequently, 5=Always)

- Developing new educational materials/sessions
- Preparing policy or evidence brief and disseminating them to relevant audiences (e.g., policy-makers, health service providers or administrators)
- Organising interactive small group meeting/workshop
- Writing plain language summaries
- Engaging with social media (e.g. Facebook, Twitter)
- Organising a media release/outreach campaign
- Creating networks or networking with end-users such as policy-makers and practitioners (e.g., give presentations to relevant networks)
- Engage champions or opinion leaders (e.g., directors, managers) to assist with sharing of research findings

BLOCK: User engagement *(based on Crockett et al., 2019)*

Directions: This section asks about your knowledge and experience with engaging potential end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) in research.

At what level have you engaged end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) in your research? *[multiple choice]*

- Letting them know about your research findings.
- Obtaining their feedback or input in any component of research.
- Working directly with end-users throughout the research process to ensure that concerns and aspirations are consistently understood and considered to the maximum extent possible.

- Partnering with end-users (i.e. shared decision-making) in each aspect of the research process.
- End-user initiated research.
- I have not engaged end-users in my research. *[exclusive option]*

[*If selected "Letting them know about your research findings"*] How did you let them know about your research findings? [*multiple choice*]

- Sent them my research papers
- Sent them evidence briefs or plain language summaries
- Presented my research to them
- Held meetings, roundtables or forums to discuss my research

[If selected "I have not engaged end-users in my research" > skip to next block]

Who have you engaged in the research process? Please select all that apply:

- Blood donors
- Blood recipients
- Blood collection staff
- Blood processing staff
- Senior management
- Policy makers
- Hospital staff
- General public
- Other, namely: _____

There are different points in the research process where end-users (e.g., policy makers, blood processing staff, hospitals, donors, recipients) could potentially be engaged. Please indicate those research phases where you have experience engaging with end-users. Please select all that apply:

- Research priority-setting
- Grant proposal/protocol writing
- Input into methodology/study design
- Development of research questions
- Data collection
- Data analysis
- Interpretation of results
- Input into the selection of research translation products
- Evaluation of research processes
- Determining future research priorities stemming from the results
- Other, please specify….

BLOCK: Importance and responsibility for KT *(based on Lynch et al., 2018)*

Directions: We would like to know more about your views on who should be responsible for and the importance of translating research into policy and/or practice.

Please rate your agreement with the following statements: (1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree)

1. It is important to me that my research is translated.
2. My research is not the sort of research that can be translated.
3. It is my responsibility to ensure that my research is translated.
4. Research translation is the responsibility of someone else in my team
5. Researchers should be responsible for translating findings into practice.
6. Stakeholders should be responsible for translating research findings into practice.
7. I know which strategies should be used (by myself/others) to translate research.
8. I have the skills to ensure research is translated.
9. There is adequate funding available to support translation of research.
10. Spending time on translating my research would take me away from research or other work-related activities I enjoy.
11. Researchers with experience/interest in implementation should translate research.
12. Every research team should include a researcher with expertise in implementation.

BLOCK: Barriers to and facilitators of KT *(based on Sibley et al., 2017)*

Directions: For the next set of questions, we would like to know more about some of the barriers you may face and facilitators that support your translation practices.

Barriers to KT

What barriers have you faced when translating or attempting to translate your research findings? Please rate your agreement with the following statements: (1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree)

Systemic/organisational barriers

1. I don't have enough funds or resources to translate my research
2. I don't feel supported by my organisation/institution to translate my research
3. I don't have the time to translate my research
4. I have too many competing priorities to translate my research
5. I don't know how to make contact with end-users (e.g., policy-makers, practitioners)

Individual barriers

6. I am worried that my research findings will not be applied or translated correctly
7. I don't have the skills or ability to translate research
8. I don't have any interest in translating research
9. Translating research does not relevant to my research
10. Translating research is not beneficial for my career
11. I don't know who is responsible for translating research

Logistical barriers

12. I experienced difficulties translating a very large body of evidence
13. I experienced physical barriers when working with rural or remote groups
14. I experienced difficulties translating research because of the current emphasis on training academics to conduct but not translate research
15. I have concerns regarding intellectual property and commercialisation
16. End-users (e.g., policy-makers, practitioners) do not understand the research

Are there any other factors that hindered you to translate your research?

Facilitators of KT

What factors have you found support the process of translating research findings? Please select all that apply

- o Maintaining good relationships with end-users (e.g., policy-makers, practitioners)
- o Clear roles in translating research
- o The ability to access resources for research translation such as funding and personnel
- o Experience and training in practising knowledge translation
- o Personal traits including drive, passion and enthusiasm
- o Trained communications personnel working on or alongside my team
- o End-users (e.g., policy-makers, practitioners) valuing research
- o None of the above [exclusive answer]
- o I have not tried to translate research

Are there any other factors that helped to translate your research?

Researcher needs for practising KT

What could be done to better support your engagement in practising research translation? [multiple choice]

- o Access to education and training
- o Access to resources to increase awareness, promotion and discussion of knowledge translation
- o Opportunities to collaborate through facilitated networks
- o Recognition for knowledge translation efforts in promotion and tenure consideration
- o More protected time to practice knowledge translation
- o I don't need any support to translate my research [exclusive answer] [*skip next question*]

What else could be done to better support you?

BLOCK: COVID-19 Effects

The effects of the current COVID-19 pandemic are far reaching. We would like to gain an understanding of how the pandemic may have affected research translation activities.

What do you think are the main effects of COVID-19 on the translation of research evidence to policy and practice in the field of transfusion medicine? (rated 1=strongly disagree, 2=disagree, 3=neither agree not disagree, 4=agree, 5=strongly agree).

1. Translating research evidence that is less relevant to the current pandemic is being put on hold.
2. Staying up to date on non-COVID-19 related research has become more difficult (e.g., due to time constraints).
3. Staying up to date on non-COVID-19 related research is not or no longer relevant for my work.
4. Research evidence relating to COVID-19 is more rapidly translated into policy and/or routine practice.
5. Research not relating to COVID-19 is being put on hold.
6. There has been more research initiated by end-users to support policy and practice changes with regards to the pandemic.
7. I work more closely with end-users to provide research evidence to support policy and practice changes.
8. Research evidence is more valued by end-users (e.g., policy-makers, practitioners).
9. There is less funding available to conduct or translate research.
10. It is harder for me to share my research findings with end-users (e.g., lack of events or workshops).
11. Policy-makers and practitioners are too busy dealing with the effects of the COVID-19 pandemic to make time to interact with researchers.

Are there any other effects of the COVID-19 pandemic on the translation of research findings into policy and practice in transfusion medicine?

[MOVE TO SURVEY END]

SURVEY END

BLOCK: Strategies to improve KT

We would like to learn more about how research translation can be improved in transfusion medicine.

Please describe one of the innovative ways your organisation uses or shares knowledge about research:

BLOCK: Survey end

We have reached the end of the survey. Do you have any additional feedback or comments regarding research translation in transfusion medicine?

Thank you for your help with our study. If you know of any other researchers, policy-makers or practitioners who would be interested in participating, please forward them this link: {*insert survey link*}

Next, you will be routed to a **separate survey** in which you can provide an email address to which we will send a summary of the results of the study, should you opt to receive it. Note that these details will not be linked to your responses to this survey.

BLOCK: Study findings

As mentioned in the main survey, we will make a summary of the results of the study available. If you want to receive a summary of the results, please enter your preferred email address below.

Note again that these details are stored separately from your survey responses and cannot be linked to your survey responses. Please double check that you have entered your email address correctly.

Email address:

Thank you for your help with our study. If you know of any other researchers, policy-makers or practitioners who would be interested in participating, please forward them this link: {*insert survey link*}

Participant Study Summary

Research Study: Examining knowledge translation among researchers working in the area of transfusion medicine: an international survey study

Research team: Amanda Thijsen, Dr Anna Williamson, A/Prof Tanya Davison, Prof Barbara Masser

What was the question?

We wanted to find out researchers' views on and practices of knowledge translation (KT) in the field of transfusion medicine. We also wanted to know what barriers they face when translating their research findings and what can be done to better support researchers in their KT efforts.

Why is it important?

Health-related research is often driven by the desire to improve the care and health of the community. The translation of research evidence into policy and practice, however, is not guaranteed, and KT activities employed by researchers through dissemination and end-user engagement are vital to achieving this goal.

What did we do?

We surveyed researchers working in transfusion medicine in May 2022. We emailed corresponding authors of papers in four major blood journals, emailed transfusion medicine grant recipients, posted on social media, and distributed the study invite through an international blood operator network. A total of 117 researchers from 33 countries completed the survey.

What did we find out?

Most participants (86%) view translating their research as important and 69% of participants consider it their responsibility to ensure that their research is translated. However, many feel they do not have skills or knowledge of strategies to translate the knowledge gained from their research (both 45%).

Researchers typically focus on sharing their knowledge through traditional diffusion strategies (86%) such as peer-reviewed publications and conference presentations. However, 60% of participants use more tailored dissemination approaches, with the most frequently used methods being plain language summaries, new educational materials, or interactive small group meetings/workshops.

Further, whilst the majority of participants (63%) had informed end-users of their research findings, almost half of the sample also had experience with consulting end-users about a research component (47%) or involving them throughout the research process (45%). A quarter of participants reported having partnered with end-users in each aspect of the research. A small proportion of participants reported not engaging end-users at all in their research (13%).

The main barriers to translating research were 1) having too many competing priorities, 2) not having the time, and 3) not having enough funds or resources. On the other hand, the main facilitators of research translation were 1) maintaining good relationships with end-users such as policy-makers and practitioners, 2) personal traits including drive, passion, and enthusiasm, and 3) end-users valuing research.

When asked what could be done to better support their engagement in practicing research translation, most participants (69%) indicated opportunities to collaborate through facilitated

networks. Participants also wanted more protected time to practice KT (65%), access to resources to increase awareness, promotion, and discussion of KT (58%), access to education and training (54%), and recognition for their KT efforts in promotion and tenure consideration (51%).

What are the next steps?

Our aim is to share our findings with the transfusion medicine community through summaries, presentations, and written publications. We are also conducting a follow-up study with end-users to learn about their experiences of using research in policy and/or practice.

Want to know more?

We've recently published part of our survey findings relating to barriers and facilitators of KT in an open access paper in the journal Transfusion: https://doi.org/10.1111/trf.17466

If you would like more information or have any questions, please contact Amanda Thijsen at athi7791@uni.sydney.edu.au.

We would like to thank you for your help with this study.

Appendix Three

Study three materials

THE UNIVERSITY OF SYDNEY

School of Public Health
Faculty of Medicine and Health

ABN 15 211 513 464

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What drives change in clinical practice at Australian Red Cross Lifeblood?

PARTICIPANT INFORMATION STATEMENT

(1) What is this study about?

You are invited to take part in a research study about how research evidence is used in clinical practice. Specifically, we want to understand how change is introduced into daily practice at a donor centre from the perspectives of frontline staff and managers. These insights will help improve future translation of research evidence into clinical practice.

You have been invited to participate in this study because you work in Donor Services at Australian Red Cross Lifeblood. This Participant Information Statement tells you about the research study. Knowing what is involved will help you decide if you want to take part in the study. Please read this sheet carefully and ask questions about anything that you don't understand or want to know more about.

Participation in this research study is voluntary.

By giving consent to take part in this study you are telling us that you:
- ✓ Understand what you have read.
- ✓ Agree to take part in the research study as outlined below.
- ✓ Agree to the use of your personal information as described.

You will be given a copy of this Participant Information Statement to keep.

(2) Who is running the study?

The study is being carried out by the following researchers:
- Amanda Thijsen, PhD Student, The University of Sydney
- Dr Anna Williamson, Research Fellow, The University of Sydney
- Prof Barbara Masser, ARCBS Chair of Donor Research, The University of Queensland
- A/Prof Tanya Davison, Director, Research Discovery, Silver Chain Group

Amanda Thijsen is conducting this study as the basis for the degree of Doctor of Philosophy at The University of Sydney. This will take place under the supervision of Dr Anna Williamson.

(3) What will the study involve for me?

You will be asked to participate in an interview about your views of how research evidence is used at Lifeblood. You will be asked about how changes within Lifeblood are communicated to you, your access to research and evidence, and your experiences with a recent initiative focusing on improving the management of iron. We will also ask you to complete a brief survey to gather some demographic information, including age, gender, and length of service.

The interview will take place at your preferred location either face-to-face at the donor centre you work at or at the Sydney Processing centre, or via telephone. The interview appointment is anticipated to last up to one hour and will be audio recorded. After the interview appointment, there will be no further involvement.

(4) How much of my time will the study take?

The interview will take approximately 45 minutes to an hour.

(5) Do I have to be in the study? Can I withdraw from the study once I've started?

Being in this study is completely voluntary and you do not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at the University of Sydney or Australian Red Cross Lifeblood.

If you decide to take part in the study and then change your mind later, you are free to withdraw at any time. You can do this by contacting Amanda Thijsen via email (athi7791@uni.sydney.edu.au) or phone (02 9234 2493). If you choose to withdraw, any information regarding your involvement in the study will be removed and destroyed.

You are free to stop the interview at any time. Unless you say that you want us to keep them, any recordings will be erased and the information you have provided will not be included in the study results. You may also refuse to answer any questions that you do not wish to answer during the interview.

(6) Are there any risks or costs associated with being in the study?

Aside from giving up your time, we do not expect that there will be any risks or costs associated with taking part in this study.

(7) Are there any benefits associated with being in the study?

We cannot guarantee that you will receive any direct benefits from being in the study.

(8) What will happen to information about me that is collected during the study?

By providing your consent, you are agreeing to us collecting personal information about you for the purposes of this research study. Your information will only be used for the purposes outlined in this Participant Information Statement, unless you consent otherwise. The audio recording of the interview will be transcribed verbatim and de-identified by removing any names of people or locations. The de-identified transcripts will be used for analysis and will be linked to the demographic information collected in the survey.

Your demographic information, the audio recording and written transcripts of the interview will be stored securely on the Lifeblood network for a minimum of 5 years. Only the research team will have access to the study data. Your identity/information will only be disclosed with your permission, except as required by law.

Study findings will be published as part of a PhD theses and may be published as a journal article and/or as a report to Lifeblood, but you will not be identified in these publications.

(9) Can I tell other people about the study?

Please don't talk to colleagues about the content of the interview, because we will be interviewing some of your colleagues about their views of using evidence in practice. You are welcome to discuss the study after we completed all the interviews.

(10) What if I would like further information about the study?

When you have read this information, Amanda Thijsen will be available to discuss it with you further and answer any questions you may have. If you would like to know more at any stage during the study, please feel free to contact Amanda Thijsen via email (athi7791@uni.sydney.edu.au) or phone (02 9234 2493).

(11) Will I be told the results of the study?

You have a right to receive feedback about the overall results of this study. We will ask you at the end of the interview if you wish to receive feedback. This feedback will be in the form of a one-page summary of our main findings sent to you via email after the study is finished.

(12) What if I have a complaint or any concerns about the study?

Research involving humans in Australia is reviewed by an independent group of people called a Human Research Ethics Committee (HREC). The ethical aspects of this study have been approved by the HREC of the University of Sydney [2020/254]. As part of this process, we have agreed to carry out the study according to the *National Statement on Ethical Conduct in Human Research (2007).* This statement has been developed to protect people who agree to take part in research studies.

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the university using the details outlined below. Please quote the study title and protocol number.

The Manager, Ethics Administration, University of Sydney:

- **Telephone:** +61 2 8627 8176
- **Email:** human.ethics@sydney.edu.au
- **Fax:** +61 2 8627 8177 (Facsimile)

This information sheet is for you to keep

THE UNIVERSITY OF SYDNEY

School of Public Health
Faculty of Medicine and Health

ABN 15 211 513 464

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What drives change in clinical practice at Australian Red Cross Lifeblood?

PARTICIPANT CONSENT FORM

I, ... [PRINT NAME], agree to take part in this research study.

In giving my consent I state that:

- I understand the purpose of the study, what I will be asked to do, and any risks/benefits involved.
- I have read the Participant Information Statement and have been able to discuss my involvement in the study with the researchers if I wished to do so.
- The researchers have answered any questions that I had about the study and I am happy with the answers.
- I understand that being in this study is completely voluntary and I do not have to take part. My decision whether to be in the study will not affect my relationship with the researchers or anyone else at the University of Sydney or Australian Red Cross Lifeblood now or in the future.
- I understand that I can withdraw from the study at any time.
- I understand that I may stop the interview at any time if I do not wish to continue, and that unless I indicate otherwise any recordings will then be erased and the information provided will not be included in the study. I also understand that I may refuse to answer any questions I don't wish to answer.
- I understand that personal information about me that is collected over the course of this project will be stored securely and will only be used for purposes that I have agreed to. I understand that information about me will only be told to others with my permission, except as required by law.
- I understand that the results of this study may be published, but these publications will not contain my name or any identifiable information about me.

I would like to receive feedback about the overall results of this study YES ☐ NO ☐

If you answered **YES**, please indicate your preferred form of feedback and address:

☐ Postal: _____

_____

☐ Email: _____

.....
Signature

.....
PRINT name

.....
Date

Interview Guide – Frontline Staff

Introduction

Before we start, I would like to know a little bit more about what you do at Lifeblood.

- Can you tell me about your current role at Lifeblood?
    - How long have you been in your current position?
- When did you start to work for Lifeblood?
    - Have you changed positions since you started?
    - And in your current role, have you always worked at this donor centre?

Research Focus 1: Implementing changes

This study is about understanding changes made at Lifeblood that are based on research evidence. Often, changes introduced in blood collection procedures and donor management are based on findings from research conducted within Australia or internationally. These can be changes made to for example standard operating procedures, forms, equipment, donor educational materials, or donor eligibility criteria.

- Are you aware of any practice changes at your donor centre or within the wider organisation that are based on research findings?
    - [If yes:] Can you briefly describe the changes that have occurred?
    - [If no:] Examples of recent changes based on research was the removal of the vCJD deferral, the recommendation for women aged less than 46 years to take a course of iron or instructing donors to use applied muscle tension during their donation.
- How are you usually informed about any practice changes? (Prompt for method [email, staff meetings], and who informs them [manager, peer])
    - What are you usually told about the change? (Probe for reason for the change)
- How important is it to you that changes are supported by research evidence? Why? Why not?
- How often do you find that changes that are being recommended are actually being implemented into routine practice?
    - How does your team make sure that changes are implemented into routine practice?
    - How does your team make sure that changes are sustained over a longer period of time?
- Can you describe an example of a change based on research evidence in your centre that went well? Why do you think it was successful?
- Can you describe an example of a change based on research evidence in your centre that didn't go so well? Why do you think it didn't work?

- In your opinion, what can be improved in how changes based on research evidence are introduced?

Research Focus 2: Knowledge translation activities

In my next set of questions, I would like to ask you about your access to knowledge from clinical research findings and other evidence-based practices. This could be new knowledge created by researchers working at Lifeblood or from international research groups. These can be shared through presentations, summaries, or in newsletters.

- Have you ever received any information about research findings? [If yes:] How has this been shared with you?
    - What do you think of these documents/presentations? Are they easy to understand?
    - Have you shared or discussed this knowledge with your team? How?
- Do you ever look for research evidence for your work or in relation to your work? Why (not)?
    - [If yes:] How do you look for it?
- What do you think is the best way to share research evidence with you?
- Do you feel like you are you encouraged to learn about new knowledge in your role? How are you encouraged?
- Apart from this study, have you ever been asked to participate or work on a research study while working at Lifeblood?
    - [If yes:] Can you tell me more about that?
    - [If no:] What are your thoughts on being involved with research?
- What are your thoughts on your role in sharing and using research evidence at Lifeblood?

Conclusion

Thank you for your time today. We're at the end of our interview. Is there anything we haven't discussed that you would like to add?

Interview Guide – Middle Managers

Introduction

Before we start, I would like to know a little bit more about what you do at Lifeblood.

- Can you tell me about your current role at Lifeblood?
    - How long have you been in your current position?
- When did you start to work for Lifeblood?
    - Have you changed positions since you started?
    - And in your current role, have you always worked at this donor centre?

Research Focus 1: Implementing changes

This study is about understanding changes made at Lifeblood that are based on research evidence. Often, changes introduced in blood collection procedures and donor management are based on findings from research conducted within Australia or internationally. These can be changes made to for example standard operating procedures, forms, equipment, donor educational materials, or donor eligibility criteria.

- Are you aware of any practice changes at your donor centre or within the wider organisation that are based on research findings?
    - [If yes:] Can you briefly describe the changes that have occurred?
    - [If no:] Examples of recent changes based on research was the removal of the vCJD deferral, the recommendation for women aged less than 46 years to take a course of iron or instructing donors to use applied muscle tension during their donation.
- How are you usually informed about any changes? (Prompt for method [email, meetings], and who informs them [manager, peer])
    - What are you usually told about the change? (Probe for reason for the change)
- How important is it to you that practice changes are supported by research evidence? Why? Why not?
- How often do you find that changes that are being recommended are actually being implemented into routine practice?
    - How do you usually make sure changes in practice are implemented in your donor centre?
    - Who is usually responsible for overseeing these changes?
    - What strategies do you use to make sure that your team sustains the change?
- Can you describe an example of a change based on research evidence in your centre that went well? Why do you think it was successful?

- Can you describe an example of a change based on research evidence that was implemented at your centre that didn't go so well? Why do you think it didn't work?
- In your opinion, what can be improved in how changes based on research evidence are introduced?

Research Focus 2: Knowledge translation activities

In my next set of questions, I would like to ask you about your access to research knowledge and evidence. This could be new knowledge created by researchers working at Lifeblood or from international research groups. These can be shared through presentations, summaries, or in newsletters.

- Have you ever received any information about research findings? [If yes:] How has this been shared with you?
    - What do you think of these documents/presentations? Are they easy to understand?
    - Is this knowledge discussed within your team? How?
- Do you ever look for research evidence for your work or in relation to your work? Why (not)?
    - [If yes:] How do you look for it?
- What do you think is the best way to share research evidence with you?
- Do you feel like you are you encouraged to learn about research and evidence in your role? How are you encouraged?
- Apart from this study, have you ever been asked to participate or work on a research study while working at Lifeblood?
    - [If yes:] Can you tell me more about that?
    - [If no:] What are your thoughts on being involved with research?
- What are your thoughts on your role in sharing and using research evidence at Lifeblood?

Conclusion

Thank you for your time today. We've reached the end of our interview. Is there anything we haven't discussed that you would like to add?

Interview Guide – Executive Leaders

Introduction

Before we start, I would like to know a little bit more about what you do at Lifeblood.

- Can you tell me about your current role at Lifeblood?
    - How long have you been in your current position?
- When did you start to work for Lifeblood?
    - Have you changed positions since you started?
    - Have you worked at a donor centre?

Research Focus 1: Role of research evidence in making changes

This study is about understanding how research evidence is used to inform policy and practice changes at Lifeblood. This can be evidence based on research conducted at Lifeblood or externally. I would now like to ask you about the role of research evidence in making changes to blood collection procedures, donor selection guidelines, and standard operating procedures at Lifeblood.

- What role, if any, does research evidence play in making any changes to blood collection procedures and guidelines?
- How important is it to you that changes to policy and practice are supported by research evidence? Why (not)?
    - Do you find internal research more compelling than international research evidence? Why (not)?
- To your knowledge, has Lifeblood undertaken internal research or commissioned external research to support policy development? [If yes] Can you give an example?
    - Has there been any research commissioned to support the implementation of a policy change? [If yes:] Can you tell me a bit more about this? [If no:] Why?
    - Has there been any research conducted to evaluate a policy change at Lifeblood? [If yes:] Can you tell me a bit more about this? [If not:] Why?
- Is it easy for you to apply research evidence to policy and procedures? Is there anything that makes this challenging or difficult?
- What do you think can be improved in how research is used to inform policy and practice changes?

Research Focus 2: Implementing changes

I would now like to ask you a few questions on how changes are implemented in blood donation centres.

- How do you usually tell donor centre teams that a change is being made?
    - Do you let the teams know that they are based on research evidence? Why (not)?
- How do you usually make sure that changes are implemented in donor centres?
    - Who is usually responsible for ensuring that changes in policy are implemented in practice?
- Do you work with researchers to implement changes that are based on research evidence?
- What strategies are used to make sure that the change is sustained over time?
- Is there a process for determining if policies have been successfully implemented?
    - Could you tell me a bit more about what happens if the implementation is sub-optimal?
    - What do you think could be improved in this process?
- In your opinion, what can be improved in how changes are implemented at Lifeblood?

Research Focus 3: Knowledge translation activities

In my next set of questions, I would like to ask you about your access to research knowledge and evidence. This could be new knowledge created by researchers working at Lifeblood or from international research groups. These can be shared through presentations, summaries, or in newsletters.

- Have you ever received any information about research findings? [If yes:] How has this been shared with you?
    - What do you think of these documents/presentations? Are they easy to understand?
    - Is this knowledge discussed within your team or senior leadership group? How?
- What do you think is the best way to share research evidence with you?
- Do you ever look for research evidence for your work or in relation to your work? Why (not)?
    - How do you look for it? (Prompt for journal alerts, conferences, ask research team)
- How easy is it for you to learn about new research and evidence in your role? Is there anything that makes it challenging or difficult?
- Do you feel like you are you encouraged to learn about research evidence in your role? How?
- Apart from this study, have you ever been asked to participate or work on a research study while working at Lifeblood?
    - [If yes:] Can you tell me more about that?
    - [If no:] What are your thoughts on being involved with research?
- What are your thoughts on your role in sharing and using research evidence at Lifeblood?

Conclusion

Thank you for your time today. We've reached the end of our interview. Is there anything we haven't discussed that you would like to add?

Appendix Four

Conference abstracts

ABSTRACT GUIDELINES ECDHM 2021
All abstracts must be in English.
The abstract text should be no more than 500 words, font size 12.
The following format must be followed: Title, Authors, Background, Aims, Methods, Results, Conclusion.
1 table or 1 figure is allowed (not required). Up to 5 references are allowed.
Please use the abstract template here below:

TEMPLATE FOR

ABSTRACT FOR ECDHM 2021

Submitting author: Amanda Thijsen
Contact e-mail address: athi7791@uni.sydney.edu.au
Submitting author's affiliation: University of Sydney
Phone no. +61481358182

If my abstract is selected for presentation I prefer (please mark your preference by an X):
Full presentation (15 Minutes): Yes: x No:
Short presentation (5 Minutes): Yes: x No:

TITLE: Examining knowledge translation in blood donor research: a review of vasovagal reaction literature

AUTHORS: Amanda Thijsen, Barbara Masser, Tanya E. Davison, Sarah P. Kruse & Anna Williamson

BACKGROUND: Knowledge translation focuses on the transfer of research findings into policy and practice. To provide insight into the state of knowledge translation in blood donor research, we undertook a rapid review of a key research area in the field with high potential for translation, vasovagal reactions (VVRs).

AIMS: The objectives of this review were to a) examine the number and nature of published studies relating to VVRs to determine the availability of research evidence, and b) map the included articles along the research-to-practice trajectory using the Knowledge to Action framework to determine the extent of knowledge translation of VVR research.

METHODS: The rapid evidence assessment approach was used to review the literature systematically. PubMed, PsycINFO, CINAHL and EMBASE were searched for peer-reviewed journal articles from inception to October 2019 using the terms blood don* AND vasovagal OR faint* OR syncope.

RESULTS: A total of 176 articles met our inclusion criteria. Studies relating to VVRs increased substantially from 1942 to 2019, with 84% published in the last twenty years. Articles were predominately observation (non-intervention) studies (117; 66%), followed by intervention (knowledge inquiry) studies (31; 18%) and review (knowledge synthesis) studies (20; 11%). The evidence from intervention research was limited, with 14 strategies tested in 31 studies and often by the same research groups. Only 5 (3%) implementation and evaluation studies were found; all focused on evaluating the effects of a newly introduced intervention on VVR rates through uncontrolled or cross-sectional study designs.

CONCLUSION: VVR research is in the early stages of knowledge translation. It is a relatively recent field of inquiry and may be too young to fully see the effects of knowledge being translated. Further, more intervention research is needed to provide a robust evidence base as well as more published implementation research to share knowledge of translating research.

REFERENCES: Thijsen, A, Masser, B, Davison, TE, Kruse, SP, Williamson, A. Examining knowledge translation in blood donor research: A review of vasovagal reaction literature. Transfusion. 2021; 1– 8. https://doi.org/10.1111/trf.16391

Examining knowledge translation practice among researchers working in transfusion medicine: a cross-sectional, international survey study

Amanda Thijsen, Anna Williamson, Barbara Masser, Tanya E Davison

Background: Knowledge translation (KT) is a growing field of research. However, not much is known about the practice of KT in the area of transfusion medicine. Insights into how researchers view and practice KT will facilitate the translation of research in transfusion medicine practice.

Objectives: This study investigated how transfusion medicine researchers practice KT, including 1) their views of KT, 2) how they share their research, and 3) how they engage with end-users.

Methods: An anonymous, cross-sectional survey was distributed by emailing corresponding authors of papers in four major blood journals, emailing transfusion medicine grant recipients, posting on social media, and using international blood operator networks.

Findings: The final sample included 118 researchers from 33 different countries. Most participants reported that research translation was important (85%) and felt it was their responsibility (69%). Less than half reported knowing which strategies to use or felt they had the skills to translate their research (both 45%). When examining how research findings are shared, most reported frequently to always using diffusion activities, including publishing in peer-reviewed journals (73%) or presenting at academic conferences (71%), while fewer used dissemination methods such as developing new educational materials (30%) or writing plain language summaries (30%). Most participants had engaged end-users in their research (86%). End-users were mainly engaged to either inform (62%), consult (47%), or involve in research (43%). To a lesser extent, participants collaborated with end-users (27%), or conducted end-user initiated research (17%). End-users were mostly engaged with data collection (67%), study design (53%) and determining future research priorities (52%), and were least engaged with evaluation (22%), data analysis (28%) and selecting research translation products (31%).

Conclusions: Whilst they acknowledge their responsibility in facilitating KT, transfusion medicine researchers feel they need to be supported to change their current practice of passive communication and end-user engagement activities to be able to successfully translate their knowledge into practice.