


Roles and effectiveness of knowledge brokers for translating clinical practice guidelines in health-related settings: a systematic review

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ABSTRACT

Background Poor translation of clinical practice guidelines (CPGs) into clinical practice is a barrier to the provision of consistent and high-quality evidence-based care. The objective was to systematically review the roles and effectiveness of knowledge brokers (KBs) for translating CPGs in health-related settings.

Methods MEDLINE, Embase, PsycINFO and CINAHL Plus were searched from 2014 to June 2022.

Randomised controlled trials (RCTs), controlled and uncontrolled preintervention and postintervention studies involving KBs, either alone or as part of a multicomponent intervention, that reported quantitative postintervention changes in guideline implementation in a healthcare setting were included. A KB was defined as an intermediary who facilitated knowledge translation by acting in at least two of the following core roles: knowledge manager, linkage agent or capacity builder. Specific activities undertaken by KBs were deductively coded to the three core roles, then common activities were inductively grouped. Screening, data extraction, quality assessment and coding were performed independently by two authors.

Results 16 studies comprising 6 RCTs, 8 uncontrolled precomparisons–postcomparisons, 1 controlled precomparison–postcomparison and 1 interrupted time series were included. 14 studies (88%) were conducted in hospital settings. Knowledge manager roles included creating and distributing guideline material. Linkage agent roles involved engaging with internal and external stakeholders. Capacity builder roles involved audit and feedback and educating staff. KBs improved guideline adherence in 10 studies (63%), had mixed impact in 2 studies (13%) and no impact in 4 studies (25%). Half of the RCTs showed KBs had no impact on guideline adherence. KBs acted as knowledge managers in 15 (94%) studies, linkage agents in 11 (69%) studies and capacity builders in all studies.

Conclusion Knowledge manager and capacity builder roles were more frequently studied than linkage agent roles. KBs had mixed impact on translating CPGs into practice. Further RCTs, including those in non-hospital settings, are required.

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WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Knowledge brokers (KBs) perform a variety of tasks across health-related settings, but the role of KBs in implementing clinical practice guidelines is unknown.

WHAT THIS STUDY ADDS

⇒ Evidence on the effectiveness of KBs at translating guidelines in health-related settings is conflicting. Heterogeneity of included studies, inconsistency in terminology and lack of robust randomised controlled trials make it difficult to draw firm conclusions.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Future research should explore effectiveness in non-hospital settings and cost-effectiveness of KBs.

INTRODUCTION

Clinical practice guidelines (CPGs) assist health professionals to deliver consistent high-quality evidence-based care. Translating evidence from CPGs into clinical practice, also known as implementation, is a challenging process.¹ Failure to implement CPG recommendations can result in suboptimal care and preventable harm.² Barriers to guideline implementation include personal factors of the health professional, such as lack of awareness, familiarity or agreement with guidelines; guideline-related factors including complexity, lack of applicability and plausibility of recommendations; or external factors including

organisational constraints, lack of collaboration or lack of resources.^{1 3–5} Identifying and implementing interventions to facilitate guideline implementation is a priority for safe and effective care.

The use of knowledge brokers (KBs) is an emerging knowledge translation strategy. KBs are individuals or groups that act as intermediaries to move knowledge between those who create the knowledge (eg, researchers and guideline developers) and those who use the knowledge (eg, healthcare professionals).^{6 7} KBs perform a diverse range of tasks tailored to the needs of their setting and stakeholders.^{8 9} A KB broadly acts in three capacities: as a ‘knowledge manager’ to identify and obtain information and tailor it to local context; as a ‘linkage agent’ to identify and engage stakeholders and facilitate communication and collaboration; and ‘capacity builder’ to deliver education, facilitate change and support sustainability.^{10 11}

Bornbaum *et al* described the nature of KBs in health-related settings, identifying 22 unique studies across seven different countries.¹⁰ Only two studies met standards for acceptable methodological rigour; thus, they concluded that ‘findings are inconclusive regarding the effectiveness of knowledge brokers’.¹⁰ Since this time, there has been increasing interest in the role of KBs driven by awareness of the need to address evidence–practice gaps. There have been no subsequent comprehensive reviews of the literature to determine if emerging evidence supports using KBs as a knowledge translation strategy. Some individual studies have demonstrated KBs facilitate use of standardised outcome measures by physical therapists¹²; some have demonstrated no improvement in evidence-informed resource allocation¹³; and others have shown early but not long-term improvement in standardised assessment.¹⁴ Little is known about the factors associated with the effectiveness of KBs in different health-related settings. These factors may include the type of knowledge (eg, type of guideline), professional background of the KB or training provided to the KBs.⁹ A realist review of KBs targeting allied health practitioners in a physical rehabilitation setting found that KBs should be embedded in the organisation and have adequate clinical, interpersonal and communication skills.¹⁵

No previous reviews have defined the roles or evaluated the effectiveness of KBs as facilitators of guideline implementation. Determining if KBs are an effective knowledge translation strategy that can help overcome barriers to CPG implementation will benefit health professionals, healthcare organisations, policy makers and governments worldwide. Thus, the objective was to systematically review both the range of roles of KBs and their effectiveness in translating CPGs in health-related settings.

METHODS

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (see online supplemental appendix 1).¹⁶ This review was registered with International Prospective Register of Systematic Reviews (CRD42022340365).

Search strategy and data sources

The literature search strategy was adapted from Bornbaum *et al*.¹⁰ The search strategy was refined and focused on ‘guideline implementation’ in consultation with an experienced information specialist. This included improvement of the efficiency of the search strategy, inclusion of potentially relevant knowledge translation terms (eg, academic detailer) and addition of ‘guideline’ as a keyword. The search strategy combined Medical Subject Headings terms and keywords related to (1) KB and (2) CPGs. MEDLINE, Embase, PsycINFO and CINAHL Plus were searched from 2014 (date of Bornbaum *et al*’s review¹⁰) to 17 June 2022. The full search strategy is reported in online supplemental appendix 2. Database searching was supplemented with manual citation tracking of included studies and relevant systematic reviews.

Study eligibility

This review included peer-reviewed, original research of interventions that described a KB, either alone or as part of a multicomponent intervention, facilitating implementation of a CPG.

Consistent with previous literature,^{10 11} a KB was defined as an ‘intermediary’ who facilitated knowledge translation by acting as at least two of the following:

- ▶ Knowledge manager (eg, creation, translation, diffusion and application of knowledge to local context).
- ▶ Linkage agent (eg, identifying and engaging stakeholders, and facilitating relationships and communication between stakeholders).
- ▶ Capacity builder (eg, developing knowledge users’ understanding and skills to facilitate and enable guideline adherence).

This definition was selected to distinguish ‘KBs’ from other roles that may only perform one of the aforementioned activities such as guideline developers (knowledge managers), local opinion leaders,¹⁷ champions¹⁸ and quality improvement collaboratives¹⁹ (linkage agents), or academic detailers (capacity builders). The rationale was that to truly act as a KB, the role would need to encompass at least two of the core activities (knowledge manager, linkage agent and capacity builder). However, recognising that KB is an emerging terminology, if a study used one of these alternative terms and the roles undertaken were consistent with our definition of KB, then we included that study in our review.

Included studies quantitatively measured postintervention changes in CPG implementation, using

any measure of guideline adherence defined by study authors, in a healthcare setting (eg, clinical practice setting such as a hospital, nursing home or primary care clinic). This included randomised controlled trials (RCTs) and controlled and uncontrolled preintervention and postintervention studies. Studies involving a comparison group were eligible if they evaluated the effectiveness of a KB compared with no intervention, usual practice or another intervention (including a different KB intervention). Feasibility studies that described the role of KBs were considered eligible, even if they were not adequately powered to evaluate effectiveness. We excluded conference abstracts, non-English and non-primary literature.

Included studies defined the roles or evaluated the effectiveness of a KB in facilitating knowledge translation to other health professionals. We excluded studies that evaluated KBs translating CPGs directly to patients (eg, patient education).

Outcomes

The primary outcome was a quantitative measure of guideline implementation or guideline adherence.

Data extraction

Two authors (AJC and CEO) independently conducted the title and abstract screen, followed by the full-text screen. Discrepancies were discussed with a third reviewer (JSB) until consensus was reached. Two authors (AJC and CEO, SK, EJJ, SSi, SSa or CJ) independently extracted data using a prepiloted data extraction tool. Extracted data included study design and setting, guideline to be implemented, details of KB role (eg, level of experience, position status, and internal or external to the organisation), justification/theoretical framework for the KB role, intervention details and guideline implementation outcomes.

Quality assessment

Two review authors (AJC and CEO, SK, EJJ, SSi, SSa or CJ) independently assessed the methodological quality of each study using an adapted version of the Joanna Briggs Institute Checklist for Randomised Controlled Trials²⁰ and the Joanna Briggs Institute Checklist for Quasi-Experimental studies.²¹ Studies were not excluded based on methodological quality.

For RCTs, 13 criteria were used to determine internal validity: random sequence generation, allocation concealment, blinding techniques (health professionals receiving the intervention, participants receiving guideline-concordant care and outcome assessors), completeness of outcome data and other sources of bias. Treatment groups were considered similar at baseline if the KB and patient (where appropriate) demographics (eg, age, gender and relevant health conditions) were reported as similar between groups, or if baseline differences were adjusted for using multivariate analyses. Statistical analyses were considered

appropriate if (1) a priori sample size calculation was conducted using appropriate statistical power and effect size; (2) planned sample size was reached; (3) clustering was accounted for when relevant; and (4) appropriate statistical methods were used to report on the objectives of the analyses (eg, association between intervention and guideline adherence using logistic regression or generalised estimating equations). Where these statistical analyses criteria were not met, methodological quality of the statistical analyses was considered as unclear unless serious concerns were identified; then they were deemed inappropriate.

For preintervention and postintervention studies, nine criteria were used to assess methodological quality. Characteristics of participants in uncontrolled preintervention and postintervention studies were considered the same if the same population was sampled (eg, the same ward, clinic or hospital). Multiple measurements of the outcome were considered appropriate if the level of guideline adherence was measured at least once before and after intervention.

For all studies, follow-up was considered complete if all participants were accounted for throughout the study or if a description of how missing data were handled was provided. Measurements of guideline-related outcomes were considered reliable if an objective measure was used, and methods to mitigate inter-rater variance were discussed.

Data synthesis and analysis

Specific roles undertaken by the KB were deductively coded to the domains of knowledge manager, linkage agent and capacity builder. These domains were based on the review of 25 qualitative, quantitative and mixed methods studies and 4 grey literature sources reviewed by Bornbaum *et al.*¹⁰ Common activities under each domain were then inductively grouped (table 1). Both deductive and inductive codings were completed by two authors (AJC and CEO) independently. The roles of the KB were then reported in a narrative format. It was not possible to conduct a meta-analysis of the effectiveness of KBs on guideline implementation due to the heterogeneity of interventions and outcomes across the included studies. Instead, the existing analyses reported in the articles reviewed were extracted and reported in a narrative format.

RESULTS

Our search identified 1075 unique titles from database searching, of which 1036 were excluded based on title and abstract (figure 1). We full-text screened 39 full texts from database searching and 11 identified from citation screening. Of the 50 full-text reports screened, 11 were excluded due to non-reporting activities of a KB, 2 having the wrong study design, 2 not being related to guideline implementation and 5 having no full text published. Overall, we included 30 reports of 16 unique studies.

Table 1 Summary of KB roles and effectiveness

	Knowledge manager		Linkage agent			Capacity builder				Effectiveness of KB intervention†
	Creating guidelines and related material*	Distribution of guidelines and related materials*	Local planning for guideline implementation	Engaging internal stakeholders	Engaging with external stakeholders	Engaging with other KBs	Education to staff	Audit and feedback to drive change	Exploring barriers and supports for sustained change	
Bosch <i>et al</i> ²³			✓	✓			✓			+
Doherty <i>et al</i> ²⁶			✓	✓	✓		✓	✓		+
Eskicioglu <i>et al</i> ²⁸		✓					✓	✓		+
García-Elorrio <i>et al</i> ²⁹	✓	✓		✓	✓		✓	✓		+
Laver <i>et al</i> ³⁷			✓	✓	✓	✓	✓	✓	✓	+
Lee <i>et al</i> ²²				✓	✓		✓			+
Lovell <i>et al</i> ²⁷		✓		✓		✓	✓	✓		–
Middleton <i>et al</i> ²⁴		✓	✓	✓	✓		✓			–
Portman <i>et al</i> ³⁰	✓	✓					✓			+
Portman <i>et al</i> ³¹	✓	✓					✓	✓		+
Reynolds <i>et al</i> ³²	✓						✓			–
Reynolds <i>et al</i> ³³	✓						✓			+
Sivertsen <i>et al</i> ³⁴		✓		✓			✓			+
Tangri <i>et al</i> ²⁵			✓	✓			✓		✓	–
Velligan <i>et al</i> ³⁶		✓		✓			✓	✓		?
Willems <i>et al</i> ³⁵			✓	✓	✓	✓			✓	?

*Clinical practice guideline summary material included reminders, quick references and educational material.

†Effectiveness of KB intervention summarised as positive (+), mixed (?) or no significant (–) impact. Further details presented in online supplemental appendix 3.
KB, knowledge broker.

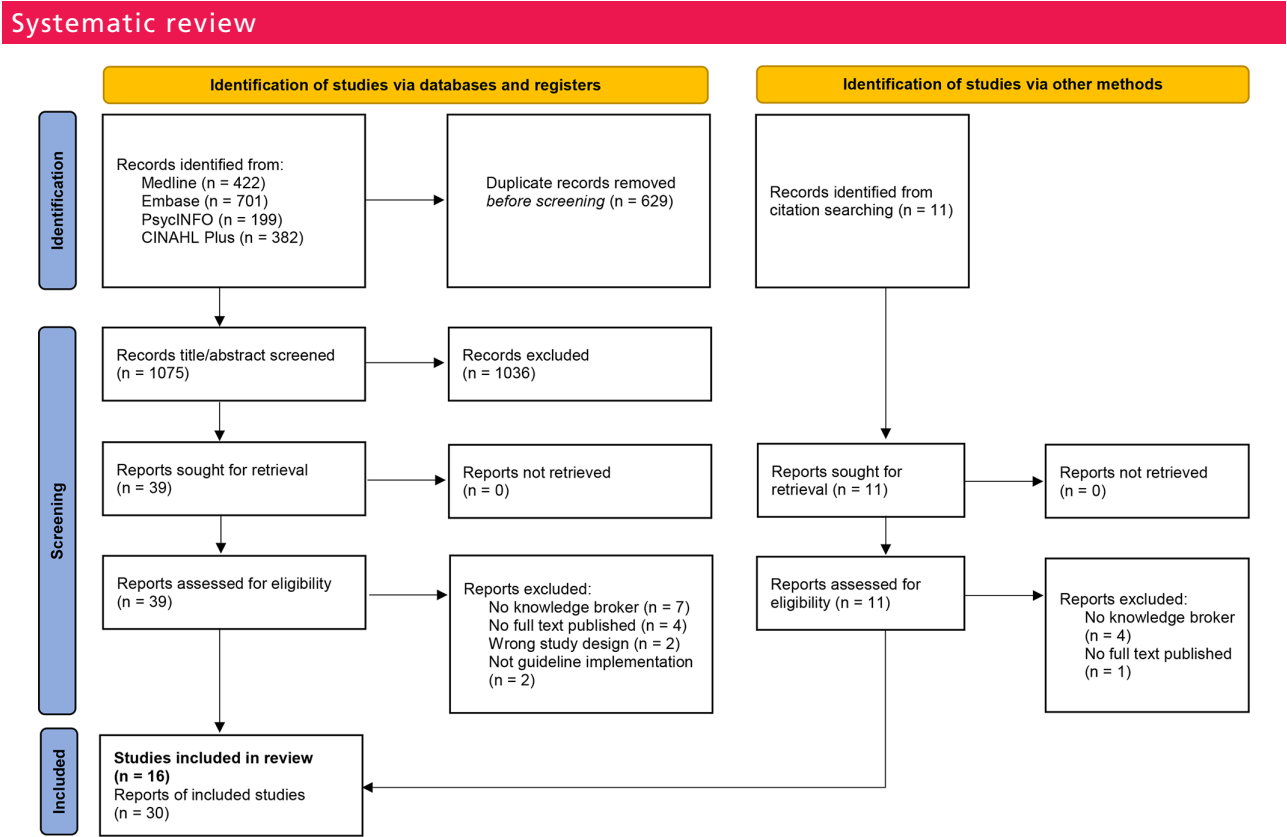


Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart.¹⁴

Study characteristics

We included 16 studies (online supplemental appendix 3), 6 RCTs (1 RCT,²² 3 cluster RCTs,^{23–25} 1 stepped wedge RCT²⁶ and 1 stepped wedge cluster RCT,²⁷ 8 uncontrolled preintervention–postintervention studies,^{28–35} 1 controlled prefeasibility–postfeasibility study³⁶ and 1 interrupted time series.³⁷ Studies were conducted in Australia,^{23 24 26 27 37} the USA,^{30–33 36} Canada,^{25 28} Malaysia,²² Netherlands,³⁵ Nicaragua²⁹ and Norway.³⁴ Majority of studies (n=14) were conducted in a hospital setting (including emergency departments, specialist clinics and outpatient clinics); 1 was conducted in community mental health clinics³⁶;

and 1 was conducted across settings in health and aged care organisations.³⁷

CPGs implemented in the included studies mostly related to appropriate screening and assessment of patients (n=7),^{23 24 26 27 32–34} provision of non-pharmacological advice (n=6)^{26 27 32 33 35 37} and pharmacological management of conditions (n=8).^{24 25 27–31 36} Four studies included CPGs of more than one type. The majority of CPGs (n=7) were related to management of neurological conditions (eg, stroke, closed head injury and dementia).^{23 24 32–35 37} Other CPGs related to management of infectious diseases,^{30 31} pregnancy

Table 2 Methodological quality appraisal using Joanna Briggs Institute Checklist for Randomised Controlled Trials

	(1)*	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Bosch <i>et al</i> ²³	Y	Y	Y	U	N	Y	Y	Y	Y	Y	Y	U	Y
Doherty <i>et al</i> ²⁶	Y	U	U	U	N	Y	Y	Y	Y	Y	N	U	Y
Lee <i>et al</i> ²²	U	Y	U	Y	U	U	Y	Y	Y	Y	Y	U	Y
Lovell <i>et al</i> ²⁷	Y	N	Y	U	N	N	Y	Y	Y	Y	U	Y	U
Middleton <i>et al</i> ²⁴	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Tangri <i>et al</i> ²⁵	Y	Y	Y	U	N	U	Y	Y	Y	Y	U	U	Y

* (1) Was true randomisation used for assignment of participants to treatment groups? (2) Was allocation to groups concealed? (3) Were treatment groups similar at the baseline? (4) Were participants blind to treatment assignment? (5) Were those delivering the intervention blind to treatment assignment? (6) Were outcomes assessors blind to intervention assignment? (7) Were groups treated identically other than the intervention of interest? (8) Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analysed? (9) Were participants analysed in the groups to which they were randomised? (10) Were guideline implementation outcomes measured in the same way for treatment groups? (11) Were guideline implementation outcomes measured in a reliable way? (12) Was appropriate statistical analysis used? (13) Was the trial design appropriate for the topic, and any deviations from the standard RCT design accounted for in the conduct and analysis? N, no; RCT, randomised controlled trial; U, unclear; Y, yes.

Table 3 Methodological quality appraisal using Joanna Briggs Institute Checklist for Quasi-Experimental Studies

	(1)*	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eskicioglu <i>et al</i> ²⁸	U	Y	Y	N	Y	Y	Y	U	Y
García-Ellorio <i>et al</i> ²⁹	Y	Y	Y	N	Y	Y	Y	Y	Y
Laver <i>et al</i> ³⁷	Y	Y	Y	N	Y	N	Y	N	Y
Portman <i>et al</i> ³⁰	Y	Y	Y	N	Y	Y	Y	U	Y
Portman <i>et al</i> ³¹	Y	Y	Y	N	Y	Y	Y	U	Y
Reynolds <i>et al</i> ³²	Y	U	Y	N	Y	Y	Y	U	Y
Reynolds <i>et al</i> ³³	Y	U	Y	N	Y	N	Y	N	Y
Sivertsen <i>et al</i> ³⁴	Y	Y	Y	N	Y	Y	Y	Y	Y
Velligan <i>et al</i> ³⁶	Y	Y	Y	Y	Y	U	U	Y	Y
Willems <i>et al</i> ³⁵	Y	Y	Y	N	Y	Y	Y	N	Y

*(1) Is it clear in the study what is the 'intervention' and what is the 'effect' (ie, there is no confusion about which variable comes first)? (2) Were the participants included in any comparisons similar? (3) Were the participants included in any comparisons receiving similar treatment/care, other than the intervention of interest? (4) Was there a control group? (5) Were there multiple measurements of the outcome (ie, ≥ 1 before and ≥ 1 after the intervention)? (6) Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analysed? (7) Were the guideline implementation outcomes of participants included in any comparisons measured in the same way? (8) Were the guideline implementation outcomes measured in a reliable way? (9) Was appropriate statistical analysis used?
 N, no; U, unclear; Y, yes.

and labour,^{26 29} colorectal surgery,²⁸ dialysis,²⁵ mental illness³⁶ and cancer pain.²⁷ One study involved a CPG relating to health professional compliance with hand hygiene.²²

Methodological quality

The quality of the included studies was variable (tables 2 and 3). For the six RCTs, true randomisation was used in five of the studies and one study was appraised as unclear as their method used was 'flipping a coin'.²² As expected, given the nature of the KB intervention, the majority (83%) were not blinded. One RCT that explored the most effective method of selecting KBs by comparing peer-selected versus management-selected KBs was rated as unclear for blinding of the person delivering the intervention because both groups were told the KB was selected by management.²² Outcome assessors were clearly blinded in half of the RCTs.^{23 24 26} RCT trial designs were mostly appropriate, but one stepped-wedge study had inconsistent time at each step and was therefore appraised as unclear.²⁷ Guideline implementation outcomes were clearly measured using an objective, reproducible method in three studies,^{22–24} a method deemed unclear in two studies^{25 27} and a subjective method involving self-report by patients in one study.²⁶ Three studies were deemed unclear in regard to statistical analysis due to sample size not being reached,²³ it being changed post protocol²⁶ or not being reported clearly.²²

For the 10 quasi-experimental studies, only one study had a control group and it reported mixed impact.³⁶ Follow-up was incomplete in two studies: one involved poor fidelity with only 28 of 45 KBs completing all components of the intervention³⁷ and one involved poor follow-up with only 14 of 75 nurses completing all assessments.³¹ Guideline implementation outcomes

were clearly measured using an objective, reproducible method in three studies,^{29 34 36} a method with unclear details in four studies^{28 30–32} and a subjective method involving self-report by patients or healthcare professionals in three studies.^{33 35 37}

Description of KB

Only one study used the terminology of KB³⁵; other labels included local opinion leader,^{23 24 26 29 32–34} hospital/clinical champion,^{24 27 28 36} change champion,³⁷ agents of change/change agent,^{22 37} academic detailer^{30 31} and knowledge translation broker.²⁵ Selection of KBs within organisations was generally by peers,^{23 29} management^{27 34–36} or both,^{32 33} and was based on individuals' skills and their ability to lead, engage, motivate and influence others. One study compared peer-identified change agents with management-selected change agents.²² Three studies had a single external KB chosen due to their skills in communicating findings²⁵ and academic detailing.^{30 31} Six studies involved KBs of a specific discipline (eg, midwives,²⁶ pharmacist^{30 31} and nurses^{32–34}), while seven studies involved KBs sampled from a variety of health professionals at each site.^{22–24 27 29 35 37} The professional background of the KBs was unclear in three studies.^{25 28 36}

The implementation interventions, including the role of the KB, were mostly designed to target barriers and enablers to change that had been identified through literature, surveys, interviews and brainstorming with local stakeholders.^{23–26 32–34 36} Four studies used theoretical frameworks in the design of their intervention, including the theoretical domains framework,^{23 24 26} models of diffusion of innovations²³ and Michie's behaviour change wheel.²⁷

Roles of KBs

KBs acted as knowledge managers in 15 (94%) of the included studies (table 1 and online supplemental

appendix 3). Knowledge manager roles included creating local CPGs and quick reference guides (n=5)^{29–33}; distributing guidelines, quick reference guides and reminders (n=8)^{24 27–31 34 36}; and developing plans for local implementation of guidelines (n=6).^{23–26 35 37} Creating (80%, n=4/5) and distributing (75%, n=6/8) guidelines and related materials were more commonly reported in the interventions that improved guideline adherence compared with developing local action plans (50%, n=3/6, +1 mixed impact.³⁵

KBs acted as linkage agents in 11 (69%) of the included studies (table 1 and online supplemental appendix 3). Linkage agent roles included engaging with internal stakeholders such as peers and management at a local level (n=10),^{22–27 34–37} engaging with external stakeholders at a service or regional level or engaging with external experts (n=6),^{22 24 26 29 35 37} and engaging with KBs at other sites (n=3).^{27 35 37} Engaging with internal (60%, n=6/10+1 mixed impact³⁵) and external stakeholders (n=67%, n=4/6, +1 mixed impact³⁵) was more commonly reported in the interventions that improved guideline adherence than engaging with other KBs (n=33%, n=1/3, +1 mixed impact³⁵).

KBs acted as capacity builders in all of the included studies (table 1 and online supplemental appendix 3). Capacity builder roles included providing education to staff (n=13),^{22–24 26–34 36} performing audit and feedback (n=7),^{26–29 31 36 37} and conducting ongoing exploration of barriers and support for sustained change (n=3).^{25 35 37} Audit and feedback (86%, n=6/7) and educating staff (77%, n=10/13) were more commonly reported in the interventions that improved guideline adherence compared with ongoing exploration of barriers and supports (n=33%, n=1/3, +1 mixed impact³⁵).

Effectiveness of interventions involving KB

Ten (62.5%) studies reported interventions involving KBs increased guideline adherence compared with usual practice.^{22 23 26 28–31 33 34 37} Three of the studies were RCTs; one reported improvement in proportion of patients who received appropriate screening (adjusted OR 20.1, 95% CI 6.8 to 59.3)²³; and one reported improvement in proportion of patients who self-reported receipt of assessment, advice and care (OR 2.32, 95% CI 1.94 to 2.76).²⁶ The third compared two methods of identifying KBs, peer-identified versus management-selected, and while both groups improved guideline adherence compared with baseline, there was no significant difference between groups.²²

Two (12.5%) studies reported mixed impact: one controlled prefeasibility–postfeasibility trial reported an increase in guideline adherence in one site but not in a second site where they lost their KB³⁶; the second reported improved adherence using a patient-reported

outcome but not when using a health professional-reported outcome.³⁵

Four (25%) studies reported no significant change in guideline adherence.^{24 25 27 32} Three were RCTs that reported no significant difference in any of the 23 quality of care outcomes measured,²⁴ the percentage of patients with reduction in pain (adjusted OR 1.12, 95% CI 0.79 to 1.60)²⁷ nor the proportion of patients who initiated dialysis early (absolute difference –2.6%, 95% CI –11.7% to 6.5%).²⁵ Heterogeneity in the study designs, interventions, guidelines and reporting of outcomes meant meta-analysis was not possible.

No clear patterns were identified between specific KB roles and effectiveness (see table 1).

DISCUSSION

This was the first systematic review to evaluate the roles and effectiveness of KBs for translating CPGs in a research context. Our review highlights the diverse roles covered by the current evidence base, the mixed impact of interventions involving KBs on guideline adherence and the variety of terms used to describe KBs. KBs had a significant impact on guideline implementation in 10 of 16 studies, including half of the RCTs (3/6) and most (7/10) of the quasi-experimental studies.

Capacity builder and knowledge manager roles were more frequently studied than linkage agent roles, and capacity building was a component of the KB's role in all included studies. Capacity building as conducted by a KB makes the role distinctly different from most local opinion leaders¹⁷ or champions¹⁸ where the capacity building activities may not occur or may be conducted by another member of the research or implementation team. The importance of the capacity builder role was highlighted in a recent Canada-wide environmental scan of KB training which found that training primarily focuses on preparing people to perform the capacity builder role.³⁸ KBs also acted as knowledge managers in 15 of the 16 included studies, using their understanding of the local context to improve processes and practices to facilitate guideline implementation in a similar fashion to stewardship programmes. Two-thirds of the included studies involved KBs acting as linkage agents between internal and external stakeholders. We conducted an audit of what has been studied rather than what happens in the real world. For this reason, it was unclear whether the linkage agent role is perceived as less important or if it was poorly described in the included studies. Communication between stakeholders was likely happening in the background of the trial setting, as communication and engagement between stakeholders are a component of clinical practice. It may be that the linkage agent role becomes more dominant in real-world settings where there are larger teams or where stakeholders are geographically separated. While the

majority of the studies in this review were conducted in a hospital or affiliated outpatient setting, the ability to effectively link stakeholders that may not be onsite at the same time suggests potential benefits for other real-world complex settings such as nursing homes or long-term care facilities.

Based on the included studies, we were unable to draw any conclusions on the ideal professional background of a KB. KBs were selected based on their clinical knowledge and ability to lead, engage, motivate and influence others. This is consistent with a previous realist review in physical rehabilitation settings that found KBs should have adequate clinical, interpersonal and communication skills.¹⁵ The KBs varied in their professional qualifications, method of appointment and number per site. It is likely that KBs need to be specifically chosen based on the target guideline, setting, audience and health professional behaviour that needs changing. However, given the number and variety of CPGs to be implemented at any one time, further research should explore the extent to which knowledge brokering is a generic skill that can be applied by the same individual across different therapeutic areas. Thirteen studies involved KBs embedded in the organisation, which has previously been identified as a factor for success.¹⁵ Selecting staff with ongoing employment contracts to be KBs may be important because loss of the KB in some sites of one study resulted in no significant improvement in guideline adherence.³⁶ Strategies, such as salary support for protected KB time,³⁵ may also be useful in supporting and retaining KBs. This may be particularly important with high rates of health professional burnout and staff turnover as a result of the COVID-19 pandemic.^{39 40}

The mixed impact of KBs on guideline adherence may have been related to inconsistencies in how KBs were defined. Only one study used the KB terminology. Two of the four studies that did not demonstrate an impact on guideline adherence provided limited details of the KB (eg, did not specify how many KBs at each site). In some multicomponent interventions, activities we would have expected the KB to undertake, such as development^{23 28 35 36} and dissemination of guidelines and resources,^{23 25 26} were carried out by other members of staff or the research team. These factors all impacted our ability to isolate the true effect of the KB.

The heterogeneity in CPGs being implemented could also have contributed to the mixed impact of KBs on guideline implementation. Implementation of some guidelines, such as initiating dialysis early²⁵ or improving management of stroke in ED,²⁴ appeared to require more complex multidisciplinary and organisational behaviour change, which may have contributed to the lack of impact seen in these studies. It may be that KBs require a greater level of organisational support or cointervention with other knowledge translation strategies to achieve success with these

guidelines. Alternatively, organisations and policy makers could focus on implementing guidelines in stages, where the practice change at each stage is more achievable. A similar trend appears in the literature involving KBs implementing non-guideline knowledge, where positive outcomes are seen in facilitating use of simple assessment tools^{12 14} but not in the promotion of evidence-informed resource allocation to inpatient weekend allied health services.¹³

There were several methodological limitations with the included studies. Less than half of the studies used an objective, reproducible method of assessing guideline implementation, and one reported improved adherence using a patient-reported outcome but not a health professional-reported outcome.³⁵ Most of the KB interventions were delivered in combination with other interventions. This made it challenging to isolate the potential impact of the KB. Similar limitations were reported in a recent Cochrane review of local opinion leaders.¹⁷ While not a focus of this review, only two studies (both RCTs) reported cost effectiveness (one quasi-experimental study is about to submit a cost-effectiveness manuscript³⁷), and none demonstrated their intervention was cost-effective.^{23 26}

Strengths and limitations

A strength of this review is the comprehensive search strategy and adherence to modern reporting standards. Limitations of the review include a lack of meta-analysis due to heterogeneity in the study designs, interventions and outcome measures. We used the outcome measures of guideline implementation and adherence reported by the authors of each study. An advantage of this approach was the opportunity to consider a broad range of implementation measures. However, for this reason, it was not possible to directly compare guideline implementation and adherence across studies. Exclusion of non-English articles and conference abstracts may have resulted in omission of articles published in other languages or new research that had not yet been published in full. The lack of standard terminology to define a KB, and the requirement that the KBs conduct at least two of the key roles (knowledge manager, linkage agent or capacity builder) means it is possible that potentially relevant studies may have been missed. This risk was mitigated as much as possible through the use of a comprehensive search strategy and review of reference lists of relevant systematic reviews and included studies. Deductive coding of roles undertaken by KBs in each study to the framework used for study selection may have influenced our findings. However, an advantage of this approach was that we were able to identify and include studies that did not use the emerging KB terminology. Inconsistent reporting and heterogeneity in KB qualifications, characteristics and training meant we were unable to examine the influence of these factors on the effectiveness of KBs.

CONCLUSION

Capacity builder and knowledge manager roles are more frequently studied than linkage agent roles. KBs demonstrated mixed impact on translating CPGs into practice. There was heterogeneity in the CPGs, KB, setting and study designs of included studies, which limited synthesis of results. Further robust evidence from RCTs is required, particularly on the role of KBs in non-hospital settings. In addition, evidence on cost-effectiveness is needed before KBs can be implemented more widely across healthcare settings to translate CPGs into practice.

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