Key Components of Knowledge Transfer & Exchange in Health Services Research: Findings from a Scoping Review

Abstract (250 words)

Aims: To identify the key common components of knowledge transfer and exchange (KTE) in existing models to facilitate practice developments in health services research.

Background: There are over 60 models of knowledge transfer and exchange designed for various areas of health care. Many of them remain untested and lack guidelines for scaling-up of successful implementation of research findings and of proven models ensuring that patients have access to optimal health care, guided by current research.

Design: A scoping review was conducted in line with PRISMA guidelines. Key components of KTE were identified using thematic analysis and frequency counts.

Data Sources: Six electronic databases were searched for papers published before January 2015 containing four key terms/variants: knowledge, transfer, framework, healthcare.

Review Methods: Double screening, extraction and coding of the data using thematic analysis were employed to ensure rigour. As further validation stakeholders consultation of the findings was performed to ensure accessibility.

Results: Of 4,288 abstracts, 294 full-text articles were screened, with 79 articles analysed. Six key components emerged: *KTE Message*, *Stakeholders* and *Process* components often appeared together, while from two contextual components *Inner Context* and the wider *Social, Cultural and Economic Context*, with the wider context less frequently considered. Finally, there was little consideration of the *Evaluation* of KTE activities. Additionally, specific operational elements of each component were identified.

Conclusions: The six components offer the basis for KTE activities, enabling researchers to more effectively share their work. Further research exploring the potential contribution of the interactions of the components is recommended.

Summary statement

Why is this research or review needed?

- There is lack of studies that inform the application of knowledge transfer and exchange strategies across various health care settings to enable evidence-based practice.
- Analysis and synthesis of existing knowledge transfer and exchange frameworks would identify their commonalities and core concepts.

What are the key findings?

- Six key components emerged from analysis of 79 articles; the KTE Message, Stakeholders and Process, Inner Context, Social, Cultural and Economic Context and Evaluation. Their prevalence varied, especially in relation to the Evaluation of KTE activities.
- Additionally, specific operational elements of each key component were identified.

How should the findings be used to influence policy/practice/research/education?

- The components and the specific operational elements offer guidance for KTE activities in applied setting and can serve as a framework within which to evaluate their impact.

Keywords: Health services research, Systematic scoping review, Research implementation, Evidence-based Practice

Word Count (Abstract/ Full-text): 249/3942 excluding abstract, tables and references

Declarations

- Ethics approval and consent to participate – Approval was not required given the documentary nature of the study and the lack of human participants (see www.ucd.ie/researchethics).
- Availability of data and material – The datasets used and/or analysed during the current study (namely the database of articles and extracted data) are available from the corresponding author on reasonable request.
- Authors' contributions: LP, SG and GWK designed the study and conducted the review. SG and CT conducted the analysis of model components, LP conducted credibility checks. LP and SG drafted the article. All authors reviewed multiple drafts of the article.

INTRODUCTION

While the ultimate aim of health research is to inform practice and policy, research findings can only change population health outcomes if adopted and embedded by health-care systems, organizations and clinicians (Grimshaw et al. 2006). Therefore, it is important to explore the most effective ways of implementing existing evidence into practice (Kutner 2011). Applying research findings to practice is especially difficult due to the broad, holistic and elements of complex interventions offered in various practice settings (Evans et al. 2013). A number of frameworks or models have been developed to provide guidance for the process of implementing research evidence into practice, including the Promoting Action on Research Implementation in Health Services framework (PARiHS; Rycroft-Malone 2004) and the Consolidated Framework for Implementation Research (CFIR, Damschroder et al. 2009). This review was performed with the focus on a specific aspect of implementation - the concept of knowledge transfer and exchange (KTE), which is often noted but not explicated in existing models in the area of implementation. Discussing the impact of implementation research in mental health services Proctor et al (2009) considers KTE in this wider context, noting the movement of research into practice settings as the basis for implementation. They also cite work by the NIH and the CDC, which defines implementation as requiring the generation of knowledge, the dissemination (transfer, our addition) of this knowledge, followed by active efforts to support the implementation of this knowledge.

Background

There are many terms used to refer to KTE related activity, including dissemination, knowledge transfer and knowledge mobilisation. A review by Pentland et al. (2011) highlighted the variation in this area, stressing the challenge that this can create in providing guidance to researchers and practitioners.. However, in order to frame the current research, it is important to be explicit about the definition of KTE that underpins this work. For this study, we adopted the following definition of KTE, as one which is routinely cited in research and reflects the views of the authors:

> "an interactive interchange of knowledge between research users and researcher producers (Kiefer et al. 2005). [Its purpose is] to increase the likelihood that research evidence will be used in policy and practice decisions and to enable researchers to identify practice and policy-relevant research questions" (cited in Mitton et al., 2007, p.729).

KTE is a complex, dynamic and iterative social process, (Kiefer et al. 2005, Ward et al. 2010, Ward et al. 2009b) which does not necessarily contribute directly to implementation but instead to an increased chance that evidence can and will be implemented. Consequently, KTE presents an early challenge to implementation of evidence-based health care. To be rigorous and effective, it has been recommended that KTE activities are guided by a model that clearly shows how the process works, and how it can help knowledge producers and users plan and evaluate KTE activities (Ward et al. 2012, Armstrong et

al. 2006, Estabrooks et al. 2009, Anderson et al. 2008). Yet, KTE as a key aspect of implementation has rarely been explicitly operationalised in existing models of implementation.

THE REVIEW

Aim

The aim of this study was to review, analyse and synthesise the key components of KTE as evidenced in published health services research. Aside from the prevalence of the individual components of the components we will also capture the operational elements of these components and their interactions. To contextualise the components and their interactions, the findings will be presented in a form of a model.

Design

A scoping approach was adopted, following a detailed protocol (Prihodova et al. 2015). The review was guided the methodological framework proposed by Arksey and O'Malley (Arksey and O'Malley 2005), with additional amendments based on Levac et al. (2010) (Levac et al. 2010). While the protocol for this review set out as one of the aims as appraisal of the relevance and suitability of these components for providers, settings and dimensions of palliative care, this study will report the general components of KTE in any healthcare setting identified by the review and their appraisal for palliative care will be addressed in a subsequent publication. Additionally, in the absence of reporting guidelines for scoping reviews, the six-stage process (Table 1) was benchmarked against the PRISMA guidelines (Moher et al. 2009) to ensure rigour.

The search strategy included four search terms and their variations (knowledge (evidence, research, information, data), transfer (exchange, generation, translation, uptake, mobilization, dissemination, implementation), framework (model, concept) and health care (health system, health service, healthcare provider)) and was designed to be as extensive as possible. The search was performed across six main electronic databases (MEDLINE, EMBASE (Elsevier), CINAHL Plus (EBSCO), PsycINFO (ProQuest), Social Services Abstracts, Applied Social Sciences Index and Abstracts (ASSIA))

Only studies that sufficiently described an original (or adapted) explicit framework, model or concept of KTE applied in health care setting were included.

To be included, articles had to provide a description of an original (or adapted) model or framework (noting that these terms are often used interchangeably) that considered the implementation of research knowledge as well as its application. This included articles which presented a specific model of KTE as well as articles that used KTE models or model elements to inform the implementation of research into practice. Limiting searches to health services settings was intended to ensure a practical focus of

the work and the potential to synthesise the operational elements of the KTE process rather than just the theoretical.

Insert Table 1 about here

Search Outcomes

The initial database search identified 7,544 abstracts with none identified elsewhere (see Figure 1). After the removal of duplicates (n=2,672; 35%), a further 7.7% of abstracts were removed due to following exclusion criteria: not research articles (n=356; book/ book chapter/ conference proceedings, etc.); low quality (n=158; no abstract, published in non-peer reviewed journals); were not involving humans (n=70). The remaining abstracts (n=4,288; 57%) were screened independently by two authors (92% agreement rate on inclusion/exclusion), resulting in 298 (3.9%) articles identified for full-text screening.

Figure 1 about here

From the identified abstracts, we were unable to source 12 full-texts and therefore 286 full-texts were reviewed independently by two reviewers, with 75% agreement on inclusion/exclusion. A further 202 articles (71%) articles were removed at the full-text review as they were found to not fit the inclusion criteria, with the final number 84 (29%) of articles included in data extraction. At the data extraction phase, the articles underwent a criteria appraisal (Table 3) and five more articles were removed following an in-depth analysis due to very vague description of the model or its application. The final number of articles included in data analysis was 79 (28%). The summary details of these articles are included in Table 2.

Data abstraction & synthesis

Analysis of extracted data was conducted at two levels: descriptive and explorative. Level 1 (descriptive analysis) involved tabulation of basic information such as study design, participant samples and the named models. Level 2 (explorative analysis) involved thematic analysis of narrative data, of the descriptions of identified models and of their visual representations. We used thematic analysis (Braun and Clarke 2006) wherein initial coding and the development of candidate themes were conducted independently by two authors, who then met to agree the final thematic map of the findings. Once the themes were agreed, two authors coded the data, while a third author conducted an independent coding check of 10% of the articles. The agreement for the credibility check of the independently coded themes was 83%. Frequency analysis provided the occurrence of each theme across the identified articles, as a reflection of the salience of the theme in the data.

As a validity check, stakeholder consultation was performed by presenting the findings at a national workshop for researchers, policy makers and patient/carer representatives in health services research. A stenographer recorded the workshop and feedback was gathered from attendees to allow reflection

on the discussions. No significant changes were made to the components; however, the discussion highlighted the need for some clarity regarding the operational elements and the nature of the interaction between components. This led to some changes in the naming of components and operational elements and more clarity on structure. A visualisation, incorporating the revisions from this process is presented in this paper.

Table 2 about here

RESULTS

Overview of Articles & Models

Of the 79 articles included in this scoping review, the majority were published in medical (53%) and nursing (25%) journals, followed by behavioural/psychological journals (7.6%), journals on medical training (6.3%), health services research (5%) and miscellaneous (2.1%). The earliest studies were published in 1985, with 2014 being the latest year included in the search; 70 articles (89%) were published after 2001, and over a third of all articles (35%) were published after 2010. This suggests a relatively recent increase in interest in the issue of knowledge transfer in health research.

Within the 79 articles were references to 88 models or frameworks (including multiple occurrences across articles), with 49 unique models/frameworks named and 13 models not explicitly named. Five models were mentioned in multiple articles, with PARiHS being the most frequently cited (Rycroft-Malone 2004). When it came to the theoretical background of the framework, 19 (24%) articles provided no information, while 24 (30%) referred to previous publications. From the remaining articles, 25 (32%) referred to multiple other models/frameworks or theories and 11 (14%) to a single framework. Over half of the articles indicated the target audience for the KTE (n = 43, 54%), with the majority proposing the use of the model in multiple stakeholder groups (n = 32, 41%).

Our quality appraisal focused on fatal flaws, as outlined by Dixon-Woods et al (Dixon-Woods et al. 2006). We also rated the level of detail in the description of the framework or its application. The findings highlight several limitations (see Table 3). All articles had clear statements of the aims and objectives, a majority (>90%) had a clearly described research design (where appropriate), and a significant proportion (76%) provided sufficient detail to analyse the framework. However, fewer articles (67%) provided a clear account of data analysis and findings or presented data to support their interpretations (40%), which may highlight the need for more critical evaluation of dissemination activities as well as limitations in the quality of this research.

Table 3 about here

Identifying the Core Components and Operational Elements of Knowledge Transfer & Exchange

From the thematic analysis, six key themes emerged to represent the core components of KTE.

The first component of KTE - the ***Message*** reflects the information to be shared. Within this component, the most common operational element was the idea that the *message is needs-driven*. This often-presented research as a clinical or practical problem, while multiple studies applying the PARiHS framework referred to the research as needs- or problem-based (Rycroft-Malone 2004, Kristensen et al. 2011, Tilson and Mickan 2014). The operational elements or attributes of the message *as credible* and *actionable* occurred with equal frequency. Research findings being actionable related to its use or application in practice and was particularly evident in articles considering the Ottawa Model of Research Use (Logan and Graham 1998, Logan et al. 1999, Pronovost et al. 2008). The *credibility of the message* referred to the use of outcomes that are considered valid (Pronovost et al. 2008). Jack and Tonmyr (Jack and Tonmyr 2008) applied Lavis' model of KTE and referred to the importance of messages containing credible information. Occurring slightly less frequently was the operational element of *the message as accessible*, which was represented in as translating the knowledge or tailoring it for key stakeholders (Tugwell et al. 2006, Kitson et al. 2013). The final operational element noted was that *multiple types of message are important*, which reflected the use of different research methods to generate messages, and the potential for research to have different messages to transfer. For example, the revised PARiHS Framework (Rycroft-Malone et al. 2002) noted that different types of research evidence are required to answer different questions relevant to practice.

The ***Process*** component represented the activities intended to implement the transfer of knowledge. This was often identified as a collaborative aspect of KTE, reflecting the 'push-pull' dynamic exchange of information. Taking the operational element of *KTE as an interactive exchange,* the Research Practice Integration model (Sterling and Weisner 2006) referred to the bidirectional relationship between stakeholders in treatment and research. KTE was described as requiring *skilled facilitation,* with multiple articles referring to PARiHS model that highlights the importance of this. The KTE processes were also expected to be *targeted and timely,* stressing the need to target key groups such as policy makers (Aguilar-Gaxiola et al. 2002b), recognising the importance of activities taking place at the right time (Haynes et al. 1995).

The **Process** component also included the operational element of *marketing the message*, reflecting the need for the communicators (typically the researchers) to communicate in a way that effectively pitched information to their target audience. Herr et al. (Herr et al. 2003, Borbas et al. 2000) drew on the Knowledge Development and Application model, discussing the need to 'get the message out' through dissemination activities. The KTE process was also recognised to require the support or endorsement of *opinion leaders/champions*, for example the article by Borbas et al. (Borbas et al. 2000) reported on their Healthcare Education and Research Foundation process, which utilises clinical opinion leaders to support research implementation, while the Translating Research into

Practice model reported by Tschannen et al.(Tschannen et al. 2011) also highlights the use of opinion leaders in the process. The final operational element reflected the need for KTE to draw on *diverse activities*, for example Aguilar-Gaxiola et al. described multiple multifaceted activities as part of research on mental health care for Mexican Americans (Aguilar-Gaxiola et al. 2002a, Aguilar-Gaxiola et al. 2002b).

The **Stakeholders** represent the people involved on either side of the exchange process. This was operationalised into four operational elements: *knowledge users, knowledge beneficiaries* and *multiple stakeholders*. The *knowledge producers* refer predominantly to the researchers themselves (Sterling and Weisner 2006, Dufault 2004, Ho et al. 2004); while *knowledge users*, sometimes referred to as knowledge consumers (Ho et al. 2004) represent the most common stakeholders - practitioners and policy makers, positioning them in the context of communities of professional practice, e.g. primary care practitioners (McCaughan 2005). The *knowledge beneficiaries* represent the wider group of patients and families who benefit from the implementation (Jack and Tonmyr 2008, Hemmelgarn et al. 2012). Finally, several papers emphasised that those involved in KTE have *multiple stakeholders* to consider including patients' families and the general public (Orlandi 1987, Anderson et al. 1999b, Ho et al. 2004).

The context for KTE was reported at two important levels: local and wider social, economic and cultural. The ***Local Context,*** addressing the immediate, often organisational environments, in which the transfer would occur, included four operational elements. The most prevalent of these was *organisational influence,* with organisations and their leaders/managers identified as key influencers in the KTE process. Senior colleagues within organisations were reported as instrumental in the adoption of research knowledge to implement change, (Dobbins et al. 2002) or support evidence-based practice (Stetler 2003). Closely linked to this was the operational element of *organisational culture*, which may be expressed as the attitudes, knowledge and values expressed within the organisation. Multiple articles implementing the PARIHS Framework (Helfrich et al. 2010) or the Translating Research into Practice model highlighted the importance of organisational culture and the importance of setting organisational standards (Tschannen et al. 2011).

Our findings highlighted the need for dedicated *resources for KTE activities*. For example, the Multisystem Model of Knowledge Integration and Translation, referred to resourcing effective implementation (Palmer and Kramlich 2011), while the Conservation of Resources Theory, recognised the range of resources required and noted that these may differ at different stages of the process (Alvaro et al. 2010). The final operational element in this section was *readiness for knowledge*. One application of PARIHS emphasised *receptivity* of the context - a factor which is common in many of the articles applying or using this KTE model (Helfrich et al. 2011).

The inclusion of the ***Social, Cultural & Economic Context*** component recognised the influence of wider environmental factors influencing research and practice. While this was the least frequent theme it was clearly evident in the Evidence-based Information Circle, designed to help practitioners engage with evidence-based practice (Thomson-O'Brien and Moreland 1998). This component included an outer context representing factors that may impact on decision making, with specific reference to aspects of the social, cultural and economic context. In the Practical, Robust Implementation and Sustainability Model the external environment was considered to have an influence on the implementation of research (Feldstein and Glasgow 2008) while in the CFIR model, the outer setting incorporating wider cultural, political and economic factors was explicitly referenced (Damschroder and Hagedorn 2011).

The final component of KTE highlighted the importance of evaluation in the model, with the concept of ***Evaluating Efficacy*** expressing the need for a mechanism for evaluation of the success of the knowledge transfer activity. It is interesting to note that, alongside the theme of Social, Cultural and Economic context, this component was least prevalent in the coding of data extracted. The Ottawa Model of Research Use (Logan and Graham 1998, Logan et al. 1999) highlighted the importance of evaluating the outcomes of KTE and implementation work, while others referred to the importance of examining the effectiveness of transfer activities (Anderson et al. 1999a) and the importance of both outcome and process evaluation (Sakala and Mayberry 2006).

Reflections on the Structure of the Components

Informed by the discussions at the stakeholder workshop, a visualisation incorporating these components is presented in Figure 2. Also included are the operational elements identified as part of the analysis and the frequency of occurrence of each component and operational element.

Figure 2 about here

Taking the components together the starting point of KTE activity is the knowledge to be transferred (**the Message**). The message is influenced **the Stakeholders,** recognising that there may be multiple groups who may influence the way the message needs to be communicated). Based on the message and the stakeholders the knowledge producer should identify **the Processes** to be used to ensure the message can be delivered to the stakeholders effectively. Also important is allowing for feedback to come back though the same channels. These interacting components sit within two identified layers, **the Local Context** and the wider **Social, Cultural and Economic Context,** and highlight the need for researchers to consider how these contexts may impact on the Message, Stakeholders and Processes.

DISCUSSION

The aim of this review was to identify key components and related operational elements of KTE, intended to guide researchers' actions in relation to KTE, in the broader context of implementation. The search identified 79 articles which included an explicit model related to transferring research findings in health settings. These articles were drawn from a range of disciplines, although medicine and nursing were the most common. The publication date range highlights a recent increase in research and dissemination activity in this area. This review identified almost 50 individual models or frameworks, with PARiHS the most frequent. Quality appraisal of the articles highlighted a number of limitations to the quality of the research; however, few articles were excluded on the basis of a lack of information on the model itself.

The thematic analysis identified six core components of KTE, three of which were commonly present in the articles. The messages to be transferred, the stakeholders and the specific processes by which transfer was achieved were considered in detail. However, the key practical finding lies in the operational elements within these components, which provide more specific and practical guidance for researchers intending to maximise the potential impact of their research. Recognising that *multiple types of message are important* highlights the need to be aware of different processes when communicating with different stakeholders. Echoing this, the use of diverse activities as part of the KTE process was rarely evident in articles, perhaps due to the dominance of traditional methods that focus on academic dissemination. Another key finding is the importance of *targeted and timely* KTE activities. Rather than planning for dissemination at the end of the research process, the evidence presented in this review stresses the need for KTE to be an ongoing activity across the lifetime of the project. While transfer processes were frequently considered in previous studies, few considered multiple processes for a single study, suggesting a simplistic, linear approach to knowledge transfer. This does not reflect the complex non-linear process of KTE evident across the findings of this review.

Recognising the context in which KTE is to take place is another key finding. While the immediate or local context was considered in more than half of the articles, the issue of the wider social, cultural and economic context was considered in less detail, with no evidence of specific operational elements to guide the researcher when considering the influence of this wider context. The need to consider not just the local but the wider context represents a possible shift in KTE activities. However, given that change in the health sector is often influenced by these wider factors (for example the impact of an economic recession), it is perhaps surprising that these aspects of the context are poorly expressed in existing models. Given the lack of representation of this component in the existing literature we would argue there is a need to increase awareness of its role in KTE and the possible activities that would operationalise this level of the process.

A novel finding is the lack of evidence that process and outcomes of KTE activity is being evaluated by those engaged in the process. Additionally, the presence of methodological issues in the studies,

such as lack of grounding in data and or detail on analysis and process, further highlights the need for rigorous evaluation of KTE activities. If researchers apply the key principles of evidence-based practice to their KTE activities, then evaluating the effectiveness of these KTE activities becomes necessary. The focus on audit of practice evident in other areas of the health services (need reference) could and should be extended to KTE, with researchers recognising the importance of assessing how effective their KTE activities have been in reaching key stakeholders, beyond more traditional metrics such as article citation counts and journal impacts.

It is important to reflect on the methodological quality of this review before final conclusions can be drawn. While the presented findings are based on evidence pre-2015, there was an exponential rise in the number of studies published since 2015; re-running the search terms employed in this review yielded over 4000 results, highlighting the urgency in understanding KTE and implementation. While in-depth analysis of the search terms is beyond the scope of this review, many of the recent studies were based on refining of existing models and clarifying the ways of using them in the process of implementation, e.g. Harvey & Kitson, 2016. There have been significant developments in the conduct and use of systematic reviews in intervention and health research, which allowed for clear guidance in the development of this review. The method of review used was mapped onto the PRISMA procedure as the agreed process for systematic reviews, and validity checks such as phases of independent review were included in the screening of articles and in the extraction and analysis of data. In addition, the methodology of the review was peer reviewed and published in advance of the completion of the study. However, there are limitations, not least the lack of engagement with unpublished and policy-related literature and the timeframe of the search (papers published before January 2015). Despite these limitations we are confident that the rigour evident in the search and analysis provides a basis for confidence in the findings.

CONCLUSION

The components identified represent both established and emerging aspects of KTE, with a clear focus on effective ways of transferring research knowledge to care providers and stakeholders and could be utilised in applied settings as well as to inform future research. Specific operational elements within these components can directly guide the researcher to maximise the activities in relation to these components. The synthesis of the components and operational elements identified potentially provides a functional model of KTE that could offer researchers the tools to ensure their KTE activities are appropriate, and a framework within which to evaluate their actions. Given the process of identification undertaken in this study the authors are tentatively proposing the structure presented in Figure 2 as an Evidence-based model for the Transfer and Exchange of Research Knowledge (EMTReK).

While requiring further research, EMTReK could act as a resource for researchers planning KTE activities, with this review establishing an initial evidence-base for the components and the operational evidence. We are conscious that the components and operational elements presented are not new, with each one less or more evident in the articles reviewed. The real potential for contribution lies in its focus on operational elements that may serve as a practical guide for researchers. In order to conduct an initial exploration of the model we have conducted a series of case studies where healthcare researchers applied the model to their own KTE activities. Initial findings are positive and highlight the need to develop a process guide to complement the description of the model presented in this article. This could be particularly important if there is increased interest in routine evaluation of KTE activities. However, it is clear that there is a need for further evaluation of the EMTReK model (including the operational elements) before a definitive statement can be made about its contribution.

We recommend that researchers consider EMTReK as a possible functional model of KTE in health services research to ensure that research is conducted with knowledge transfer in mind from the earliest phases of the process. We also recommend that researchers develop evaluation strategies to both assess their activities and to provide feedback on the potential contribution of this model.

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Appendix. List of Tables & Supplementary materials.

Table 1: Stages of systematic review applied

Table 2: Studies identified by systematic review and included in the final analysis grouped by model used.

Table 3. Quality appraisal of articles included in the scoping review

Supplementary materials 1.

Studies identified by systematic review and included in the final analysis listed in chronological order