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REVIEW ARTICLE

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Criteria for the selection, evaluation and application of traditional knowledge in contemporary health practice, education, research and policy: A systematic review

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Abstract

Background: Traditional and complementary medicine (T&CM) is highly utilised and draws on traditional knowledge (TK) as evidence, raising a need to explore how TK is currently used.

Objectives: Examine criteria used to select, evaluate and apply TK in contemporary health contexts.

Methods: Systematic search utilising academic databases (AMED, CINAHL, MEDLINE, EMBASE, SSCI, ProQuest Dissertations Theses Global), Trip clinical database and Google search engine. Citations and reference lists of included articles were searched. Reported use of TK in contemporary settings was mapped against a modified 'Exploration-Preparation-Implementation-Sustainment' (EPIS) implementation framework.

Results: From the 54 included articles, EPIS mapping found TK is primarily used in the Exploration phase of implementation ($n = 54$), with little reporting on Preparation ($n = 16$), Implementation process ($n = 6$) or Sustainment ($n = 4$) of TK implementation. Criteria used in selection, evaluation and application of TK commonly involved validation with other scientific/traditional evidence sources, or assessment of factors influencing knowledge translation.

Discussion: One of the difficulties in validation of TK (as a co-opted treatment) against other evidence sources is comparing like with like as TK often takes a holistic approach. This complicates further planning and evaluation of implementation.

Conclusion: This review identifies important criteria for evaluating current and potential contemporary use of TK, identifying gaps in research and practice for finding, appraising and applying relevant TK studies for clinical care.

KEYWORDS

database searching; implementation; knowledge translation; review, systematic

BACKGROUND

Traditional and complementary medicine (T&CM) refers to a diverse range of health care systems, products and practices used in the prevention, diagnosis and management of health conditions but not generally fully integrated into dominant health care systems (World Health Organization, 2019). These practices may or may not be indigenous to a country, and history of use may span decades (e.g., nutritional supplementation) or millennia (e.g., traditional Chinese medicine) (World Health Organization, 2019). Even though T&CM is not considered mainstream in most countries, it is used across the globe (Adams, Andrews, et al., 2012; Adams, Schneider, et al., 2012) and the expressed demand for these services is considerable. Globally, the 12-month prevalence rate of T&CM provider use has previously been reported at 26.4%, ranging from 10% in Eastern Europe to 50% in mainland China (Peltzer & Pengpid, 2018). When self-prescribed T&CM has been included, median rates of use have risen to between 47% and 76% (Diorio et al., 2017; James et al., 2018; Joeliantina et al., 2019).

While T&CM sits largely outside most dominant health care systems, the World Health Organization (WHO) recommend the integration of T&CM into health care services as one important strategy to help improve health service delivery and health outcomes (World Health Organization, 2013). Notwithstanding, to align with quality health care mandates (as is required for any health treatment or therapy), the integration of T&CM into a dominant health care system needs to be supported by quality evidence (Agency for Healthcare Research and Quality, 2022; Australian Commission on Safety and Quality in Health Care, 2022; Care Quality Commission, 2022).

To some extent, the integration of T&CM into mainstream health systems may be viewed by some policy and practice decision-makers as problematic as many T&CM providers rely on traditional knowledge (TK) as a foundational form of evidence to inform their clinical decision making (Alcantara & Leach, 2015; Leach, 2022; Snow et al., 2017; Sullivan et al., 2017; Sundberg et al., 2019). Within the context of T&CM, TK represents the intellectual and cultural heritage passed down over generations of practice through written or oral documentation (Abbott, 2014; World Health Organization, 2019). TK is inclusive of the explicit content of knowledge (e.g., *Materia medica* texts outlining the uses of herbal medicines), as well as tacit knowledge associated with the TK (e.g., cultural expressions of applied knowledge; Abbott, 2014). While T&CM systems may draw on a variety of knowledge sources, including contemporary sources such as scientific research, it is the heritage of TK that shapes ongoing practices of T&CM systems (World Health Organization, 2019).

Key Messages

- Finding relevant traditional knowledge studies involved not only a search strategy across many databases but citation tracking and hand-searching of the references of included papers.
- The EPIS (Exploration, Preparation, Implementation, Sustainment) framework was useful in assessing the extent, and nature of traditional knowledge usage alongside contemporary scientific medical care.
- There are gaps in current research and practice norms that hinder the implementation of traditional knowledge, as set out in the Astana declaration, into evidence-based practice.

In mainstream health settings, TK may be considered an unsuitable form of evidence to fully guide health care decisions, even though it is consistent with the evidenced-based practice paradigm, which calls for the 'best available evidence' to be utilised from empirical research, clinical expertise, patients and their circumstances (Leach, 2006). TK is developed over extensive periods of time from empirical observation, clinical experience and response to population needs, providing valuable insight into safety and efficacy that can be complementary to modern scientific evidence (Adams et al., 2019; Helmstädter & Staiger, 2014; Lemonnier et al., 2017). The Astana Declaration—the WHO-led guiding document of primary health care—has also explicitly directed that primary health care must be driven by both scientific and TK (World Health Organization, 1978). Unlike with other forms of evidence (e.g., systematic reviews, clinical trials; Ma et al., 2020; Shea et al., 2017), there is little guidance available on how to evaluate and implement TK into practice as part of the provision of quality evidence-based health care.

To directly address this knowledge gap, we conducted a systematic review of the criteria applied when TK is used as evidence in contemporary health settings (research, clinical practice, education and policy). The review synthesis employed an implementation science framework—a form of the widely-used EPIS (Exploration, Preparation, Implementation, Sustainment) Framework, modified by Movsisyan et al. (2019) to describe the process of adapting complex interventions (such as the use of TK from traditional medicine systems

in T&CM) into new settings (such as the contemporary context; Movsisyan et al., 2019).

METHODS

This review aimed to identify what criteria are used during the selection, evaluation and application of TK from traditional medicine systems into contemporary health contexts. A review protocol was drafted in alignment with the PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 Checklist (Moher et al., 2015) and registered with PROSPERO international prospective register for systematic reviews (no.CRD42021236916).

Search strategy and sources

The search strategy was drafted and tested in consultation with a research librarian. The initial search was conducted on 28 January 2021, encompassing the AMED (Ovid), CINAHL (EBSCOhost), MEDLINE (Ovid), EMBASE (Ovid), SOCIAL SCIENCES CITATION INDEX (Web of Science) and PROQUEST DISSERTATIONS and THESES GLOBAL DATABASES. A manual search was also conducted on the Trip Pro clinical database using keywords from the search strategy to explore any relevant regulatory and clinical guidelines. The Google search engine was interrogated to identify grey literature. Due to the scarcity of regulatory and grey literature sources, neither Trip Pro nor Google were searched systematically. Additional hand-searching of the reference lists of included articles was undertaken, as was citation tracking through the Google Scholar 'cited by' function to identify potentially relevant literature that had cited the included articles (completed 27 May 2021).

Three search strings were crafted and combined to capture relevant studies. String 1 included search terms relating to the use (selection, evaluation, application) of TK. String 2 described the parameters of TK with reference to the traditional medicine systems recognised by the WHO (World Health Organization, 2019). String 3 defined the health context (practice, education, research and policy) in accordance with the review aim. Truncation symbols were used to ensure inclusion of related terms and proximity searching was applied where appropriate to further refine the relevance of literature captured. The limits and expanders applied were tailored to optimise the features specific to each database. A date range was set to cover literature published since 1978, chosen to align with the adoption by the WHO and its member states of the Alma-Ata Declaration in recognition of the role of Traditional Medicine systems in primary health care (World Health Organization, 1978). The full systematic search strategy is outlined in Table 1.

Eligibility criteria

In order to capture literature reporting on practice, research, education or policy informed by TK, articles were considered for inclusion if they reported methods or results describing the selection, evaluation or application of TK within the context of contemporary health (whether specific to T&CM settings or not). For the purposes of our review, TK was defined in alignment with established definitions adopted by the WHO (World Health Organization, 2019) and the World Intellectual Property Organization (WIPO; Abbott, 2014) as relating to or being part of a knowledge system embedded within the culture of a traditional medicine system. Meanwhile, contemporary context was defined as being current to the time when the included *article was written*. Inclusion criteria extended to: (1) any original research study design and (2) reviews of traditional texts that demonstrated the selection, evaluation or application of TK in a research context. Articles were excluded if the study aim and methods were not focused on examination of TK as a concept, such as studies focussed on bioprospecting (where TK was used solely as a resource for commercial drug discovery) or reframing TK concepts into biomedical perspectives (e.g., determining the intended meaning of TK using biomedical terminology). Studies reporting clinical knowledge using consensus among contemporary experts of a traditional medicine system as the sole representation of TK were also excluded from the review as it was not known to what extent such expert opinions reflect the TK of their professions, as opposed to reflecting more contemporary knowledge. No articles were excluded based on language.

Screening and selection

Citations were imported to the Covidence online systematic review management platform (Veritas Health Innovation, 2021) to facilitate transparency and consensus decision-making during screening, data extraction and critical appraisal. Duplicates were removed and a screening framework checklist was employed to standardise the screening process against eligibility criteria (see Appendix). Study titles and abstracts were screened against the framework checklist by one reviewer (HF). The retained citations were then each screened by two reviewers (HF, AS) by full text content. Discrepancies between the two

TABLE 1 Search strategy.

Review topic: Criteria for the selection, evaluation and application of traditional knowledge in contemporary health practice, education, research and policy			
Date of search: Jan 1978 to Jan 2021			
Search strings	**Database platform**	**Limits and expanders**	**Citations**
String 1 Select* OR evaluat* OR apprais* OR assess* OR application OR utilis* OR usage **AND** **String 2** Traditional OR historical OR cultural OR indigenous OR aboriginal OR native OR Ayurved* OR Unani OR homeopath* OR Siddha OR Naturopath* OR chiropractic OR osteopath* OR acupuncture OR "traditional Chinese medicine" **ADJ-8 (proximity within 8 words)** Knowledge OR evidence OR practice OR heritage **AND** **String 3** Health OR healthcare OR medicine OR medical **ADJ-8 (proximity within 8 words)** Practice OR policy OR education OR training OR curriculum OR research	AMED *Ovid*	MeSH expander	425
	EMBASE *Ovid*	MeSH expander	2569
	OVID MEDLINE *Ovid*	MeSH expander	3712
	CINAHL *EBSCOhost*	MeSH expander	3031
	SOCIAL SCIENCES CITATION INDEX *Web of Science*	Topic field limit (to allow proximity searching)	1662
	PROQUEST DISSERTATIONS AND THESES GLOBAL *ProQuest*	'Anywhere except full text' limit	75

reviewers regarding study selection and reasons for exclusion were resolved by discussion until consensus was reached. Articles in languages other than English were screened against the framework checklist by external researchers fluent in the relevant language, in consultation with the reviewers.

Data extraction and critical appraisal

Data were extracted from the selected articles into pre-prepared forms outlining:

1. Article characteristics: first author, year, study design, location, tradition discussed, sample size, source of TK, source of analytical perspective,
2. The context surrounding the use of TK: practice, education, research, policy,
3. Additional knowledge or evidence sources used to triangulate/correlate data or findings (e.g., published scientific research),
4. Criteria regarding the use of TK (e.g., frequency of reported use, plausibility of efficacy, perceived authority of source), and
5. the manuscript section from which the content related to the review the criteria were taken (methods or results).

The reviewers also provided notes in the extraction form to facilitate accurate interpretation of the identified criteria. Data extraction was completed in duplicate by HF and AS with discrepancies discussed until reaching consensus.

Conventional critical appraisal tools were not considered feasible or suitable due to the nature of the research question and the heterogeneity of included study designs. Instead, the level of methodological detail regarding TK sources was graded as a reporting criterion, while critical attention was given to the analytic perspective of each article. Methodological detail was assessed for all articles where data on the use of TK were extracted from the study's reported methods and was graded as Low, Moderate or High to capture the extent of methodological reporting. The ratings were defined as follows:

1. Low—*reference to use of traditional information sources provided, but no details regarding how they were selected or used*;
2. Moderate—*reference to use of traditional information sources and some details about how they were selected or used, but not sufficient to replicate the process*; or
3. High—*clear description of how traditional information sources were selected and used, sufficient to replicate the process*.

The analytic perspective provided by each article graded the strength of the views of participants and interpretation by researchers. It was rated as Strong, Moderate or Weak, depending on whether the authorship

represented individuals who could reasonably be considered authoritative regarding:

1. The *tradition* in question (e.g., practitioners of the tradition), or
2. The *context* of its application (e.g., researchers in a research context).

The rating of perceive authority in the analytic perspective was determined by examining included articles and institutional websites for available details of author affiliations, disciplines, qualifications and topics covered in authors' other publications and projects. This appraisal was conducted in duplicate by AS and HF, with discrepancies discussed until consensus was reached.

Synthesis

After completing data extraction, a preliminary examination of the data were undertaken by HF and AS to summarise prevailing trends and themes. The trends and themes were subsequently discussed with all authors to identify a suitable framework through which to map thematic categorisation. Movsisyan et al. (2019) outlines a framework of implementation for complex interventions and was selected due to its applicability to adapting interventions (in this case, TK) to new contexts (contemporary practice). Movsisyan et al.'s process maps 12 steps of adaptation within the four phases of the EPIS Framework (Exploration, Preparation, Implementation, Sustainment)—a widely used framework for guiding and describing implementation processes (Moullin et al., 2019). Extracted data were then revisited and thematically categorised into the steps of Movsisyan et al.'s process by comparing the extracted data with the description of each step. The twelve steps are as follows:

1. Initial assessment,
2. Intervention selection,
3. Intervention exploration,
4. Identification of potential mismatches,
5. Intervention model development,
6. Establishment of networks, capacity and infrastructure,
7. Undertaking modifications,
8. (Pilot) testing,
9. Intervention revision and implementation,
10. Evaluation,
11. Maintenance and evolution,
12. Sustainment.

This approach allowed identification of the manner in which TK is being translated to the contemporary context (practice, research, education or policy), as well as identification of any gaps in the steps based on the current evidence.

RESULTS

The search strategy returned a total of 7778 non-duplicate citations, of which 25 met inclusion criteria and were ultimately selected for review. Citation tracking and hand-searching of included papers' reference lists returned a further 1087 and 4431 citations, respectively (including duplicates), of which 29 articles were retained as meeting inclusion criteria. The final pool included 54 articles for review, reporting results from 51 distinct studies. Citation tracking and reference list checking was particularly successful for locating related studies conducted by the same researchers of the study being traced. Five rounds of citation tracking were conducted before a decision was made to stop due to data saturation. The study selection process is overviewed in Figure 1. The most common reasons for excluding articles at full-text screening were that the study was not original research nor a review of traditional texts ($n = 90$), or did not respond directly to the research question ($n = 67$). Reasons for exclusion at full-text screening are outlined in full in Supplementary Table S1.

Study characteristics

Table 2 provides a detailed overview of study characteristics with citations. The selected studies were published between 1999 and 2021 and were predominantly journal articles. With the exception of two theses, no grey literature was selected. The most common study design involved analysis of the content in traditional or historical texts (content analysis or text data-mining) ($n = 35$) while others included interview studies ($n = 9$), survey studies ($n = 2$), roundtable discussions ($n = 2$), focus groups alone ($n = 1$) or combined with interviews ($n = 1$), development and validation of tools ($n = 1$) or interventions ($n = 1$), and mixed methods approaches ($n = 2$; one involving a survey, Delphi study, literature review and guideline development, and one a case study, clinical trial and intervention development). Studies were conducted across a diverse range of locations, spanning all six WHO World Regions, with some studies involving multiple countries.

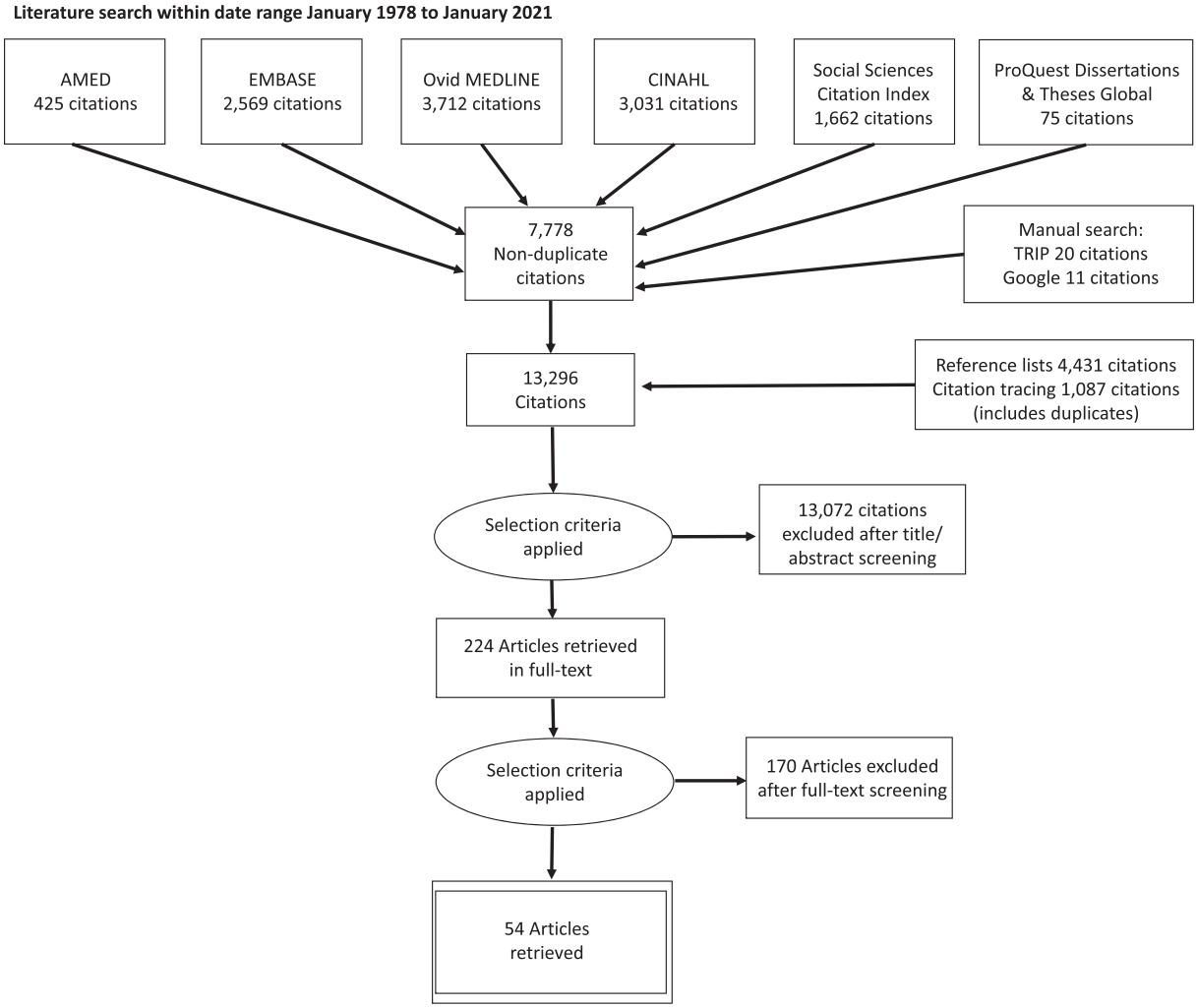

FIGURE 1 PRISMA flow-chart overview of study selection process.

The traditional medicine systems most commonly examined were traditional Chinese medicine (TCM; $n = 14$) and Western/European herbal medicine ($n = 14$), followed by traditional Iranian/Persian medicine ($n = 6$), naturopathy ($n = 6$), traditional Korean medicine ($n = 5$), osteopathy($n = 3$), T&CM as a group ($n = 2$), herbal medicine systems from around the world ($n = 1$), homeopathy ($n = 1$), traditional Thai medicine ($n = 1$), traditional medicine of Mali ($n = 1$), and Ayurveda ($n = 1$). Sources of TK were predominantly traditional texts, accessed in hardcopy or via electronic databases ($n = 36$). It was also common for studies to examine TK use through the behaviours and perspectives of TM practitioners and experts (e.g., educators, researchers; $n = 13$). Other sources of TK were via relevant clinical practice guidelines ($n = 2$) and interdisciplinary expert panels ($n = 3$).

The perspectives through which data were analysed predominantly represented the discipline and expertise of the researchers ($n = 34$), which related to the tradition under study ($n = 21$), to unrelated disciplines ($n = 10$) or encompassed a multi-disciplinary collaboration of both ($n = 3$). The discipline of researchers was unclear in two studies. Studies of practitioner behaviours as the source of data ($n = 13$) differed, typically presenting results from the practitioner perspective ($n = 11$), except for one study involving a blended perspective resulting from participatory collaboration between researchers and traditional healers, and another which conducted statistical analysis from quantitative data. One study collected data from a multi-disciplinary panel of T&CM stakeholders, whose perspectives framed the results. Statistical analysis was the focus in four articles, which drew data from traditional texts. Data were extracted exclusively from the Methods section in 26 articles, exclusively from the Results section in 15 articles, and from both these sections in the remaining 14 articles.

TABLE 2 Characteristics of included studies.

First author	Year	Study design	Location	Traditional medicine system	Source (sample)	Perspective	Data located[a]	
							Methods	Results
Adams	2007	Content analysis/ text data mining	Switzerland	Herbal medicine traditions from around the world	Literature containing ethnobotanical information, sourced from Swiss university libraries or academic journals ($n = 52$)	Pharmaceutical researchers	Y	
Adams	2009	Content analysis/ text data mining	Switzerland	Western/European herbal medicine	Traditional European herbal texts ($n = 5$)	Pharmaceutical clinicians and historians	Y	Y
Adams	2011	Content analysis/ text data mining	Switzerland	Western/European herbal medicine	Important herbals from the 16th and 17th centuries ($n = 8$)	Pharmaceutical researchers	Y	
Adams	2012	Content analysis/ text data mining	Switzerland	Western/European herbal medicine	European herbals of the 16th and 17th Century ($n = 9$)	Pharmaceutical researchers	Y	
Adams	2017	Interview	USA, Canada	Naturopathy	Naturopathic physicians (accredited) in practice >2 years ($n = 9$)	Naturopathic physicians (accredited) in practice >2 years		Y
Alizadeh	2017	Content analysis/ text data mining	Iran	Traditional Iranian/ Persian medicine	Authoritative Iranian traditional medicine books (minimum seven texts [full list not provided])	Experts in Iranian traditional medicine	Y	
Arabshahi	2015	Interview	Iran	Traditional Iranian/ Persian medicine	Physicians, pharmacists, basic scientists, paramedical graduate ($n = 13$)	Physicians, pharmacists, basic scientists, paramedical graduate		Y
Bae	2019	Content analysis/ text data mining	Korea	Traditional Korean medicine	Dongui Bogam traditional text compilation ($n = 1$)	Statistical analysis	Y	Y
Bettelli	2020	Interview	Italy	Osteopathy	Osteopaths with >5 years clinical experience, active clinical practice and educational experience	Osteopaths with >5 years clinical experience, active clinical practice and educational experience		Y
Birch	1999	Content analysis/ text data mining	Netherlands, USA	Traditional Chinese medicine	TCM acupuncture original Chinese texts or texts commonly used in English-speaking countries ($n = 16$)	Researchers from acupuncture institutions	Y	Y
Brien	2012	Development and validation of assessment tool	UK	Homeopathy	Clinicians and experts ($n =$ not specified). Hering's Law as traditional knowledge.	Statistical analysis	Y	

(Continues)

TABLE 2 (Continued)

First author	Year	Study design	Location	Traditional medicine system	Source (sample)	Perspective	Data located[a]	
							Methods	Results
Brosnan	2016	Interview	Australia	Traditional Chinese medicine and Osteopathy	Osteopathy and TCM lecturers ($n = 20$)	Osteopathy and TCM lecturers		Y
Buentzel	2020	Content analysis/ text data mining	Germany	Western/European herbal medicine	Popular science books containing medicinal plant treatments for oral mucositis ($n = 14$)	Unclear	Y	
Canaway	2018	Roundtable discussion	Australia	Traditional and complementary medicine	'Expert stakeholders' defined as academics, practitioners, industry and consumers/ patient advocates ($n = 17$)	'Expert stakeholders' (academics, practitioners, industry, consumers/ patient advocates)		Y
Chen	2020	Content analysis/ text data mining	China	Traditional Chinese medicine	TCM prescriptions from a range of traditional and contemporary sources ($n = 107$)	Statistical analysis	Y	
Chen	2015	Survey, Delphi panel, literature review and guideline development	China	Traditional Chinese medicine	Ancient texts ($n =$ not specified)	'Experts' not otherwise defined	Y	
Choi	2015	Content analysis/ text data mining	Korea	Traditional Korean medicine	Dongui Bogam traditional text compilation ($n = 1$)	Korean medicine researchers and social scientists	Y	
Connelly	2020	Content analysis/ text data mining coupled to pre-clinical or laboratory methodology	USA	Western/European herbal medicine	Medieval text ($n = 1$)	Network analysis	Y	Y
De Vos	2010	Content analysis/ text data mining	USA	Western/European herbal medicine	Mediterranean/European medical texts from 5th to 9th centuries ($n = 12$)	Historian and pharmaceutical	Y	
Fatali	2020a	Content analysis/ text data mining	Iran	Traditional Iranian/ Persian medicine	Traditional Persian medicine texts ($n = 7$)	Researchers from institutions of traditional Persian medicine	Y	

TABLE 2 (Continued)

First author	Year	Study design	Location	Traditional medicine system	Source (sample)	Perspective	Data located[a]	
							Methods	Results
Fatali	2020b	Content analysis and interview	Iran	Traditional Iranian/ Persian medicine	Traditional Persian medicine textbooks ($n = 10$) and experts ($n = 2$)	Experts in traditional Persian medicine and researchers from traditional Persian medicine institutions	Y	
Flatt	2016	Focus group, interview	Australia	Western/European herbal medicine	Western herbal medicine practitioners ($n = 44$)	Western herbal medicine practitioners		Y
Gerontakos	2021	Focus group	Australia	Naturopathy and Western/European herbal medicine	Naturopaths and Western herbalists with >5 years clinical experience ($n = 17$)	Naturopaths and Western herbalists with >5 years clinical experience		Y
Guo-Jing	2020	Content analysis/ text data mining	China	Traditional Chinese medicine	TCM prescriptions from a range of traditional, contemporary and clinical practitioner sources ($n = 24$)	TCM clinicians and researchers	Y	Y
Han	2017	Content analysis/ text data mining	Korea	Traditional Korean Medicine	Dongui Bogam traditional text compilation ($n = 1$)	Korean Medicine researchers	Y	
Harrison	2015	Content analysis/ text data mining coupled to pre-clinical or laboratory methodology	UK	Western/European herbal medicine	Medieval text (Bald's Leechbook) ($n = 1$)	Interdisciplinary research team from health and life sciences and history	Y	Y
Jaric	2014	Content analysis/ text data mining	Serbia	Western/European herbal medicine	Medieval codex of medical manuscripts (Chilander Medical Codex no. 517) from 15th to 16th centuries ($n = 1$)	Biology researchers	Y	
Kadam	2020	Content analysis/ text data mining coupled to pre-clinical or laboratory methodology	India	Ayurveda	Historical treatises of Indian traditional medicine ($n = 4$)	Bioscience researchers and an Ayurvedic doctor	Y	Y
Kasiri-Martino	2016	Interview	UK	Osteopathy	Osteopathic clinicians and educators ($n = 9$)	Osteopathic clinicians and educators		Y

(Continues)

TABLE 2 (Continued)

First author	Year	Study design	Location	Traditional medicine system	Source (sample)	Perspective	Data located[a]	
							Methods	Results
Lardos	2011	Content analysis/ text data mining	Cyprus and UK	Western/European herbal medicine	Iatrosophic texts from Cyprus ($n = 6$)	Pharmacognostic/ phytotherapy researchers	Y	
Leach	2018	Roundtable discussion	Australia	Traditional and complementary medicine	Experts in clinical practice ($n = 17$)	Experts with professional area/focus of expertise in clinical practice (i.e., T&CM, medicine or allied health care), and academic research/ education		Y
Lumlerdkij	2018	Interview	Thailand	Traditional Thai medicine	Thai traditional medicine practitioners with experience in treating relevant condition ($n = 33$)	Thai traditional medicine practitioners with experience in treating relevant condition		Y
May	2012; 2014	Content analysis/ text data mining	Australia, China, Hong Kong	Traditional Chinese medicine	Collections and compilations of pre-modern traditional Chinese medicine literature ($n = 14$)	Researchers from traditional medicine institutions	Y	Y
May	2016	Content analysis/ text data mining	Australia	Traditional Chinese medicine	Encyclopaedia of traditional Chinese medicine (Zhong Hua Yi Dian; $n = 1$)	Chinese medicine researchers	Y	
Pae	2016	Content analysis/ text data mining	Korea	Traditional Korean medicine	Dongui Bogam traditional text compilation ($n = 1$)	Statistical analysis	Y	
Pak	2016	Content analysis/ text data mining	Korea	Traditional Korean medicine	Dongui Bogam traditional text compilation ($n = 1$)	Korean Medicine researchers	Y	
Park	2018	Content analysis/ text data mining	Korea	Traditional Korean medicine	Dongui Bogam traditional text compilation ($n = 1$)	Korean Medicine researchers	Y	
Petran	2020	Content analysis/ text data mining	Romania	Western/European herbal medicine	Various historical and modern sources detailing Romanian traditional medicine ($n = 12$)	Researchers from functional science and biochemistry departments	Y	
Reid	2018	Content analysis/ text data mining	Australia, Canada, USA	Naturopathy	Traditional texts with authors clearly linked to the naturopathic profession ($n = 87$)	Naturopathic researchers	Y	

TABLE 2 (Continued)

First author	Year	Study design	Location	Traditional medicine system	Source (sample)	Perspective	Data located[a]	
							Methods	Results
Sahranavard	2014	Content analysis/ text data mining	Iran	Traditional Iranian/ Persian medicine	Books considered the most important Iranian herbals between the 10th and 18th centuries ($n = 5$)	Traditional Iranian medicine researchers	Y	
Steel	2011a; 2011b; 2011c	Interview	Australia	Naturopathy	Naturopaths in active practice ($n = 12$)	Naturopaths in active practice		Y
Thomas	2011	Content analysis/ text data mining	UK	Western/European herbal medicine	Medieval text (Bald's Leechbook) ($n = 1$)	Unclear	Y	Y
Wang	2017	Survey	China	Traditional Chinese medicine	Clinical practice guidelines ($n = 361$)	TCM clinicians working in gynaecology		Y
Watkins	2012	Content analysis/ text data mining coupled to pre-clinical or laboratory methodology	UK	Western/European herbal medicine	Traditional Anglo-Saxon texts and supporting literature ($n =$ unclear)	Medical researchers	Y	
Willcox	2015	Case study including clinical trial, intervention development and implementation	Mali	Traditional medicine of Mali	Local traditional healers ($n = 30$)	Primary care and public health researchers, and a local traditional healer	Y	Y
Xia	2020	Content analysis/ text data mining	China	Traditional Chinese medicine	Encyclopaedia of Traditional Chinese medicine ($n = 1$)	Researchers from traditional medicine institutions	Y	Y
Yang	2019	Content analysis/ text data mining	China	Traditional Chinese medicine	Electronic Encyclopaedia of Chinese medicine ($n = 1$)	Chinese medicine researchers and clinicians	Y	
Yao	2021	Intervention development and validation	Australia	Traditional Chinese medicine	Experts in Tai Chi, TCM or oncology ($n =$ not specified)	Experts in Tai Chi, TCM or oncology		Y
Yao	2018	Survey	China	Traditional Chinese medicine	Clinical practice guidelines ($n = 1004$)	TCM and Western medicine clinicians		Y
Zargaran	2016	Content analysis/ text data mining	Iran	Traditional Iranian/ Persian medicine	Traditional texts ($n =$ not specified)	Researchers in traditional Iranian medicine field	Y	

(Continues)

TABLE 2 (Continued)

First author	Year	Study design	Location	Traditional medicine system	Source (sample)	Perspective	Data located[a]	
							Methods	Results
Zhang	2014	Content analysis/ text data mining	China	Traditional Chinese medicine	Encyclopaedia of Traditional Chinese Medicine (CDROM version 4.0, includes 1009 Chinese medical books written before the emergence of the People's Republic of China (1949; $n = 1$)	TCM and other medical researchers	Y	

[a]Y = Data were extracted from this section of the article.

Critical appraisal findings

Of the 40 articles that provided data from the Methods section and were thus appraised for methodological detail in reporting, 10 were graded as high, 27 as moderate, and 3 as low in detail. The degree of authority attributed to the perspective of each article in relation to the tradition it discussed was most commonly graded as Strong ($n = 31$), followed by Moderate ($n = 12$) and Weak ($n = 11$). The degree of authority attributed in relation to context (practice, research, education, policy) was most commonly graded as Strong ($n = 31$), followed by Moderate ($n = 22$), with one study graded as Weak. Full details in Table 3.

Framework mapping findings

All 54 studies were mapped to the Exploration phase of the EPIS framework having reported on methods or results relating to one or more of the steps in this part of the process of adapting TK to contemporary contexts. The most reported of the three steps in the Exploration phase was Step 2, *Intervention selection* ($n = 47$), which was also the most reported step from the framework overall. Sixteen studies reported on methods or results relating to one or more of the three steps in the preparation phase of the EPIS framework. The most common of these was Step 4, *Identification of potential mismatches* ($n = 13$), while only one study reported on Step 6, *Establishment of networks, capacity and infrastructure*. Within the Implementation phase, six studies were mapped to at least one of the three steps. Five of these reported on Step 7, *Undertaking modifications*, two on Step 9, *Intervention revision and implementation* and one on Step 8, *(Pilot) Testing*. Sustainment was the phase least reported on, having been mapped to only four studies; Step 10, *Evaluation* was described in all four studies and Step 11, *Maintenance and evolution* was described in one. Full details of the findings mapped to the modified EPIS framework are presented in Table 4, while notes generated during the mapping process can be accessed in Supporting Information Table S2. A summary of the key results for each phase is presented in Table 5.

The contexts within which each study was translating or adapting TK, as shown in Table 4, were most frequently clinical practice ($n = 41$) and research ($n = 41$), while education ($n = 5$) and policy ($n = 4$) were less common. Approximately half of the studies ($n = 28$) were considerate of more than one context. More than half of the studies ($n = 34$) used at least one additional source of information to triangulate or correlate their findings with other data (see Figure 2); most commonly, findings

TABLE 3 Critical appraisal results.

First author	Year	Methods detail[a]	Authority on tradition	Authority on context
Adams	2007	Moderate	Weak	Moderate
Adams	2009	Moderate	Weak	Moderate
Adams	2011	High	Weak	Strong
Adams	2012	High	Weak	Moderate
Adams	2017	–	Strong	Strong
Alizadeh	2017	Moderate	Strong	Moderate
Arabshahi	2015	–	Strong	Strong
Bae	2019	High	Moderate	Moderate
Bettelli	2020	–	Strong	Strong
Birch	1999	High	Strong	Strong
Brien	2012	Moderate	Moderate	Strong
Brosnan	2016	–	Strong	Strong
Buentzel	2020	Moderate	Weak	Moderate
Canaway	2018	–	Moderate	Strong
Chen	2015	Moderate	Moderate	Moderate
Chen	2020	Moderate	Moderate	Strong
Choi	2015	Moderate	Moderate	Moderate
Connelly	2020	High	Weak	Moderate
De Vos	2010	High	Weak	Weak
Fatali	2020a	Moderate	Strong	Moderate
Fatali	2020b	Low	Strong	Moderate
Flatt	2016	–	Strong	Strong
Gerontakos	2021	–	Strong	Strong
Guo-Jing	2020	Moderate	Strong	Moderate
Han	2017	Moderate	Strong	Strong
Harrison	2015	Moderate	Weak	Moderate
Jaric	2014	Moderate	Weak	Strong
Kadam	2020	Moderate	Strong	Strong
Kasiri-Martino	2016	–	Strong	Strong
Lardos	2011	High	Strong	Strong
Leach	2018	–	Strong	Strong
Lumlerdkij	2018	–	Strong	Strong
May	2012	High	Moderate	Moderate
May	2014	Moderate	Strong	Strong
May	2016	Moderate	Strong	Strong
Pae	2016	High		Strong
Pak	2016	Moderate	Strong	Strong
Park	2018	Moderate	Strong	Strong
Petran	2020	High	Weak	Moderate
Reid	2018	Moderate	Strong	Strong
Sahranavard	2014	Moderate	Strong	Strong
Steel	2011a; 2011b; 2011c	–	Strong	Strong

(Continues)

TABLE 3 (Continued)

First author	Year	Methods detail[a]	Authority on tradition	Authority on context
Thomas	2011	Moderate	Moderate	Moderate
Wang	2017	Low	Moderate	Moderate
Watkins	2012	Moderate	Weak	Moderate
Willcox	2015	Moderate	Moderate	Strong
Xia	2020	Moderate	Strong	Moderate
Yang	2019	Moderate	Strong	Strong
Yao	2018	Low	Moderate	Moderate
Yao	2021	–	Strong	Strong
Zargaran	2016	Moderate	Strong	Moderate
Zhang	2014	Moderate	Moderate	Moderate

Note: This methodological detail was not rated for studies where data were extracted from the Results alone.
[a]The level of detail presented in the methods regarding how TK sources were selected, evaluated or applied was rated as follows: Low: Reference to use of traditional information sources provided, but no details regarding how they were selected or used. Moderate: Reference to use of traditional information sources and some details about how they were selected or used, but not sufficient to replicate the process. High: Clear description of how traditional information sources were selected and used, sufficient to replicate the process.

were compared with published scientific research ($n = 21$), with other methods including validation by a panel of experts ($n = 7$) or the authors' own original research ($n = 6$), comparison with contemporary texts ($n = 3$) or clinical practice guidelines, trials or implementation of a traditional intervention in real-world settings ($n = 2$), and an assessment of the current commercial availability of traditional remedies as a proxy measure for their continued use ($n = 1$).

Exploration phase

Step 1–Initial assessment: When initial assessments of TK for selection, evaluation or application were undertaken and reported in the reviewed literature, they involved identification of the potential role of the TK within the broader contemporary health care context (Bae et al., 2019; Brien et al., 2012; Brosnan, 2016; Flatt, 2016; Zargaran et al., 2016). One study also undertook initial assessment by identifying the needs arising from the contemporary scientific context, such as a need for standardised traditional assessment tools (Brien et al., 2012).

Step 2—Intervention selection: The most common method used to inform selection of interventions involved positioning the traditional evidence alongside scientific evidence, contemporary texts and/or expert opinion to draw comparisons, validate evidence or develop a 'totality of evidence' (Adams et al., 2007, 2011; Adams, Schneider, et al., 2012; Arabshahi et al., 2015; Bae et al., 2019; Buentzel et al., 2020; Chen et al., 2015; Choi et al., 2015; De Vos, 2010; Fatali, Emami, et al., 2020; Fatali, Sadeghpour, et al., 2020; Guo-Jing et al., 2020; Han et al., 2017; Lardos et al., 2011; Leach et al., 2018; May et al., 2016; Pae et al., 2016; Park et al., 2018; Petran et al., 2020; Sahranavard et al., 2014; Steel & Adams, 2011b; Thomas, 2011; Watkins et al., 2012; Xia et al., 2020; Yang et al., 2019; Zhang et al., 2014). It was also common for selection processes to place importance on TK with greater predominance in traditional sources, such as interventions appearing frequently within or across sources, and those with consistency of use over time as proxy measures for safety and potential efficacy (Alizadeh et al., 2017; Bae et al., 2019; Birch & Sherman, 1999; Buentzel et al., 2020; Chen et al., 2015, 2020; Connelly et al., 2020; De Vos, 2010; Flatt, 2016; Guo-Jing et al., 2020; Han et al., 2017; Lardos et al., 2011; May et al., 2014; Sahranavard et al., 2014; Steel & Adams, 2011c; Thomas, 2011; Xia et al., 2020; Zhang et al., 2014). The perceived authority, authenticity and influential impact of the source on its tradition were also given importance during selection of TK in research and practice (; Adams et al., 2011; Adams, Schneider, et al., 2012; Alizadeh et al., 2017; Bae et al., 2019; Connelly et al., 2020; De Vos, 2010; Flatt, 2016; Jaric et al., 2014; May et al., 2012; Petran et al., 2020; Reid et al., 2018; Yang et al., 2019).

Sixteen studies gave attention to the translation of TK across languages and time, often with detailed scrutiny regarding philosophical approaches, identification of botanical sources and factual understanding of health conditions (Adams et al., 2009, 2011; Adams, Schneider, et al., 2012; Birch & Sherman, 1999; Choi et al., 2015; De

TABLE 4 Results of mapping to a modified EPIS framework and triangulation sources of included studies.

	Exploration			Preparation			Implementation			Sustainment	
Author (date)	**1. Initial assessment**	**2. Intervention selection**	**3. Intervention exploration**	**4. Identification of potential mismatches**	**5. Intervention model development**	**6. Establishment of networks, capacity and infrastructure**	**7. Undertaking modifications**	**8. (pilot) testing**	**9. Intervention revision and implementation**	**10. Evaluation**	**11. Maintenance and evolution**
Adams et al. (2007)		Y									
Adams et al. (2009)		Y	Y								
Adams et al. (2011)		Y									
Adams, Andrews, et al. (2012), Adams, Schneider, et al. (2012)		Y									
Adams (2017)		Y	Y				Y			Y	
Alizadeh et al. (2017)		Y									
Arabshahi et al. (2015)		Y	Y				Y				
Bae et al. (2019)	Y	Y									
Bettelli et al. (2020)		Y		Y							
Birch and Sherman (1999)		Y									
Brien et al. (2012)	Y		Y		Y						
Brosnan (2016)	Y	Y	Y								
Buentzel et al. (2020)		Y									
Canaway et al. (2018)		Y	Y	Y							
Chen et al. (2015)		Y									
Chen et al. (2020)		Y									
Choi et al. (2015)		Y									
Connelly et al. (2020)		Y	Y	Y							
De Vos (2010)		Y									
Fatali, Sadeghpour, et al. (2020)		Y									
Fatali, Emami, et al. (2020)		Y									
Flatt (2016)	Y	Y	Y	Y						Y	
Gerontakos et al. (2021)			Y						Y	Y	
Guo-Jing et al. (2020)		Y									
Han et al. (2017)		Y									

(Continues)

TABLE 4 (Continued)

Harrison et al. (2015)		Y	Y	Y								
Jaric et al. (2014)	Y											
Kadam et al. (2020)	Y											
Kasiri-Martino and Bright (2016)		Y	Y									
Lardos et al. (2011)	Y											
Leach et al. (2018)	Y	Y										
Lumlerdkij et al. (2018)	Y											
May et al. (2012, 2014)	Y	Y	Y									
May et al. (2016)	Y											
Pae et al. (2016)	Y											
Pak et al. (2016)	Y	Y										
Park et al. (2018)	Y											
Petran et al. (2020)	Y											
Reid et al. (2018)	Y											
Sahranavard et al. (2014)	Y											
Steel & Adams, 2011a, 2011b, 2011c)	Y	Y										
Thomas (2011)	Y	Y	Y									
Wang et al. (2017)		Y	Y									
Watkins et al. (2012)	Y	Y	Y									
Willcox et al. (2015)	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	
Xia et al. (2020)	Y											
Yang et al. (2019)	Y											
Yao et al. (2018)	Y	Y	Y									
Yao et al. (2021)			Y	Y		Y						
Zargaran et al. (2016) Y		Y		Y		Y						
Zhang et al. (2014)	Y	Y										

TABLE 4 (Continued)

Author (date)	Context				Triangulation sources					
	Practice	Education	Research	Policy	Published research	Expert panel	Own original research	Contemporary texts	Applied clinical use	Other
Adams et al. (2007)			Y							
Adams et al. (2009)			Y		Y					
Adams et al. (2011)			Y							
Adams, Andrews, et al. (2012), Adams, Schneider, et al. (2012)	Y		Y							
Adams (2017)	Y	Y								
Alizadeh et al. (2017)	Y									
Arabshahi et al. (2015)	Y									
Bae et al. (2019)	Y		Y							
Bettelli et al. (2020)	Y									
Birch and Sherman (1999))	Y		Y							
Brien et al. (2012)	Y		Y			Y			Y	
Brosnan (2016)	Y	Y	Y							
Buentzel et al. (2020)	Y		Y		Y					
Canaway et al. (2018)	Y	Y	Y	Y						
Chen et al. (2015)	Y		Y	Y		Y				
Chen et al. (2020)	Y		Y							
Choi et al. (2015)	Y		Y							
Connelly et al. (2020)			Y							
De Vos (2010)	Y		Y							
Fatali, Sadeghpour, et al. (2020)	Y									
Fatali, Emami, et al. (2020)	Y					Y				
Flatt (2016)	Y				Y					
Gerontakos et al. (2021)	Y				Y					
Guo-Jing et al. (2020)	Y		Y		Y	Y				
Han et al. (2017)	Y		Y							
Harrison et al. (2015)			Y		Y		Y			
Jaric et al. (2014)			Y							
Kadam et al. (2020)	Y		Y				Y			
Kasiri-Martino and Bright (2016)		Y				Y				
Lardos et al. (2011)			Y							

Leach et al. (2018)	Y	Y	Y	Y				
Lumlerdkij et al. (2018)	Y		Y		Y			
May et al. (2012, 2014)			Y					
May et al. (2016)	Y		Y					
Pae et al. (2016)	Y		Y					
Pak et al. (2016)	Y		Y					
Park et al. (2018)	Y		Y					
Petran et al. (2020)			Y					
Reid et al. (2018)	Y		Y					
Sahranavard et al. (2014)	Y		Y					
Steel & Adams, 2011a, 2011b, 2011c)	Y		Y					
Thomas (2011)	Y							
Wang et al. (2017)	Y					Y		Y
Watkins et al. (2012)	Y		Y					
Willcox et al. (2015)	Y		Y	Y				
Xia et al. (2020)	Y		Y					
Yang et al. (2019)	Y		Y					
Yao et al. (2018)	Y					Y		
Yao et al. (2021)			Y		Y	Y		
Zargaran et al. (2016)	Y						Y	
Zhang et al. (2014)			Y		Y			

TABLE 5 Summary characteristics of approach to the steps in the EPIS Framework demonstrated in included studies.

Phase	Step	Characteristics of the approach to the step demonstrated in included studies
Exploration	Initial assessment	• Identify the broader role of the TK within the contemporary health care or scientific context
	Intervention selection	• Triangulate TK with other information sources to draw comparisons, validate evidence or develop a 'totality of evidence' • Prioritised TK occurring with more consistency, within and across sources or temporally • Importance of TK sources with perceived authority, authenticity, or influence within the traditional medicine system (applies to written TK sources and practitioners of living systems of traditional medicine) • Translate TK across cultures, languages and time including consideration of philosophical approaches, identification of botanical sources, and historical understanding of health conditions • Ensure fidelity and authenticity of TK as its own system of medicine
	Intervention Exploration	• Examine both traditional and contemporary perspectives without requiring alignment between both views • Explore pragmatic adaptations to meet contemporary patient and health care needs • Examine whether inconsistencies or contradictions exist across sources, or if interventions are still in use
Preparation	Identification of potential mismatches	• Identify discrepancies or limitations impacting the translation of TK to contemporary contexts • Identify contemporary scientific evidence contradicting TK or resulting in TK being rendered obsolete
	Intervention model development	• Adapt TK to meet the needs of the target population and relevant local or sociocultural circumstances • Aim to retain the integrity of the intervention's core traditional characteristics
	Establishment of networks, capacity and infrastructure	• Account for ethical aspects of adapting TK e.g., intellectual property rights of TK custodians, and environmental and social sustainability of the intervention
Implementation	Undertaking modifications	• Clinical practice: Adapt to suit patient needs, employing professional judgement/clinical experience to determine the necessity and relevance of adaptations • Population interventions: Consult stakeholders to critique or validate modifications • Meet contemporary quality and safety standards without compromising the integrity of the traditional philosophy, theory or practice
	(Pilot) Testing	• Engage with stakeholders including individuals with expert knowledge to guide and inform pilot testing
	Intervention revision and implementation	• Collaborate with patient populations to adjust interventions to suit contemporary circumstances
Sustainment	Evaluation	• Evaluate outcomes using contemporary outcome measures appropriate to the intervention
	Maintenance and evolution	• Consider the potential for the intervention to provide economic benefit to the local community

Vos, 2010; Han et al., 2017; Jaric et al., 2014; Kadam et al., 2020; Lardos et al., 2011; Pak et al., 2016; Park et al., 2018; Petran et al., 2020; Sahranavard et al., 2014; Thomas, 2011; Watkins et al., 2012). These studies recognised such translation as a common challenge in the selection and application of TK to contemporary contexts. The relevance of TK to the contemporary health and medical context was considered important in some studies (Birch & Sherman, 1999; Kadam et al., 2020; May et al., 2012; Yao et al., 2018), with accessibility

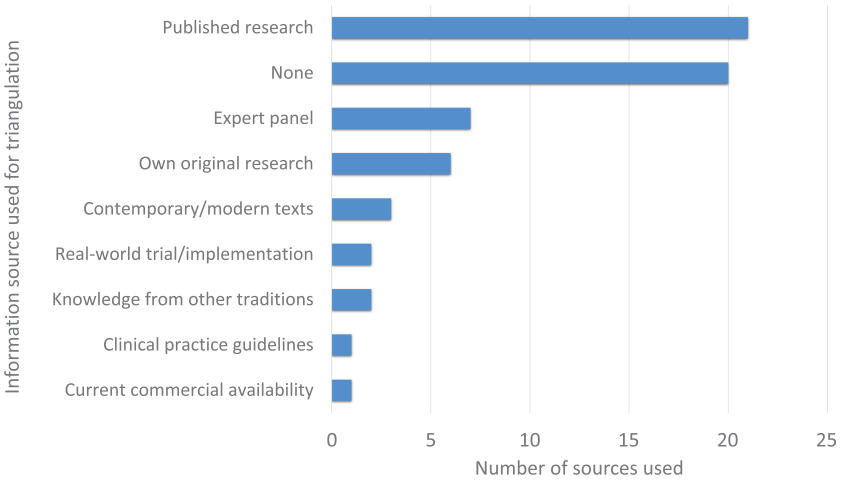

FIGURE 2 Frequency of information sources used to triangulate traditional knowledge in included studies. [Colour figure can be viewed at wileyonlinelibrary.com]

(Yang et al., 2019) and cross-cultural and socio-political relevance also considered at times (Canaway et al., 2018). Differences between traditional and contemporary context were sometimes considered during selection of TK (Arabshahi et al., 2015), typically with a pragmatic approach accounting for factors specific to the research, intervention, practice or patient circumstances (Adams, 2017; Bettelli et al., 2020; Flatt, 2016; Lumlerdkij et al., 2018; Watkins et al., 2012); this included recognition of when TK is not reasonably applicable (Brosnan, 2016).

One study highlighted a need to consider fidelity and maintain the authenticity of TK as its own system of medicine, independent of conventional medical knowledge (Brosnan, 2016). One study selected its source based on how representative it was of the tradition's knowledge-base (May et al., 2016), while another invested substantial time in observing and engaging with the practitioners of a living tradition (Willcox et al., 2015). One study included a criterion that botanical sources drawn from TK sources would only be considered for selection if they were environmentally sustainable (not subject to conservation orders; Watkins et al., 2012).

Step 3—Intervention exploration: During intervention exploration, TK theory and practice were examined from both traditional and contemporary views, without equating the two perspectives, in order to avoid reductionism or misapplication of TK while also incorporating the benefits of scientific research (Adams et al., 2009; Canaway et al., 2018; Connelly et al., 2020; Flatt, 2016; Gerontakos et al., 2021; Harrison et al., 2015; May et al., 2014; Steel & Adams, 2011c). TK was explored for pragmatic adaptations to meet the needs of individual patients and the requirements of contemporary environments (Adams, 2017; Brien et al., 2012; Brosnan, 2016), while also ensuring core characteristics were preserved to maintain the integrity of the tradition (Flatt, 2016; Harrison et al., 2015; Zargaran et al., 2016). Some studies critically examined TK for inconsistencies and contradictions across sources (Leach et al., 2018; Zhang et al., 2014) or identified whether interventions were still in use (Thomas, 2011). Three studies explored the selected intervention through novel pharmacological research (Pak et al., 2016; Watkins et al., 2012; Willcox et al., 2015).

Preparation phase

Step 4—Identification of potential mismatches: The flaws and limitations surrounding translation of TK to contemporary contexts, or in the face of contradictory scientific evidence were examined to identify discrepancies (Bettelli et al., 2020; Connelly et al., 2020; Flatt, 2016; Kasiri-Martino & Bright, 2016; May et al., 2014; Wang et al., 2017; Watkins et al., 2012; Yao et al., 2018, 2021). The potential impact of modernisation on the safety and efficacy of TK use was examined in two studies (Canaway et al., 2018; Harrison et al., 2015), while another identified factors which could result in a traditional intervention becoming obsolete (Thomas, 2011).

Step 5—Intervention model development: Application of the TK to contemporary contexts involved pragmatic adaptation to the target population and relevant local or sociocultural circumstances (Brien et al., 2012; Yao et al., 2021). Intervention development also included efforts to retain the integrity of the intervention's traditional core characteristics (Harrison et al., 2015; Willcox et al., 2015; Zargaran et al., 2016).

Step 6—Establishment of networks, capacity and infrastructure: When reporting on establishment of networks, capacity and infrastructure for an intervention

implementation, one study emphasised the ethical aspects of adapting TK, accounting for the intellectual property rights of TK custodians, providing ongoing support, and ensuring all stakeholders were able to participate in and benefit from the implementation process (Willcox et al., 2015).

Implementation phase

Step 7—Undertaking modifications: When applied in clinical practice, TK was reportedly adapted to suit individual patients' needs, using professional/clinical experience to judge the necessity and relevance of adaptations (Adams, 2017; Arabshahi et al., 2015). When implementing at a population level, one study reported consulting stakeholders to critique or validate modifications to the intervention through expert consensus (Yao et al., 2021). Modifications of TK were approached with the intention of addressing contemporary quality and safety standards without compromising the integrity of traditional philosophy, theory or practice (Willcox et al., 2015; Zargaran et al., 2016).

Step 8—(Pilot)Testing: One study piloted the adapted medicine, with the guidance and participation of stakeholders (community leaders/village chiefs, families and other village members, traditional healers and national, district and local authorities), in a randomised controlled trial (Willcox et al., 2015). Stakeholder consultation included meetings open to the whole population of the village community.

Step 9—Intervention revision and implementation: When using TK in practice, care was invested in trialling and revising the clinical application of TK, working with patients to adjust interventions to suit patient and contemporary circumstances (Gerontakos et al., 2021; Willcox et al., 2015).

Sustainment phase

Step 10—Evaluation: Contemporary tools such as pathology testing were used in clinical practice to evaluate the outcomes of TK use, alongside examination of clinical notes and charts (Adams, 2017; Flatt, 2016; Gerontakos et al., 2021). At a populations level, one study evaluated the outcome of implementation of an adapted intervention within a district area (Willcox et al., 2015).

Step 11—Maintenance and evolution: One study considered the future maintenance and sustainment of an adapted intervention by exploring its potential to provide economic benefit to the local community (Willcox et al., 2015).

DISCUSSION

This review provides a critical examination of the criteria used in contemporary literature involving translation of TK to practice, research, policy and educational contexts. Our review findings elucidate the criteria applied by researchers in such processes of translation, as well as identifying several areas in need of greater engagement to fill translational gaps. The tension between traditional medicine systems and evidence-based medicine in applied practice has been a source of challenge (Fung et al., 2015), opportunity (Jutte et al., 2017) and debate (Leach, 2016; Wiese, 2016) in recent years. By mapping the reviewed literature through an implementation science perspective using an adapted EPIS framework (Movsisyan et al., 2019), our study provides important insights on how to better bridge the gap between TK and contemporary health care to achieve appropriate and effective implementation of traditional evidence.

Our use of the framework mapping to examine how TK was adapted to a contemporary context in the reviewed literature identified an imbalance in thematic categorisation across the EPIS framework. Namely, the literature focussed largely on the *Exploration* phase with little attention to the *Preparation*, *Implementation* and *Sustainment* phases of the implementation process. Moreover, within the *Exploration* phase, studies primarily engaged with TK for the purposes of intervention selection rather than engaging in deeper exploration of the knowledge itself. While our eligibility criteria excluded articles explicitly focussed on bioprospecting, this finding regarding intervention selection may nevertheless suggest a persistent underlying focus on drug discovery or co-option of traditionally used treatments. Such a suggestion is implied even outside of explicit bioprospecting studies—which seek to develop commercial products through exploration of natural resources (Mateo et al., 2001)—as the interventions selected in our reviewed articles were commonly assessed against pre-clinical scientific research. While there is a long history of TK being utilised as a source for pharmaceutical drug discovery, it is important to distinguish between integral TK use and drug-discovery as there are a number of practical and ethical considerations that conflict with bioprospecting approaches (Castree, 2003; Rose et al., 2012). Our review shows evidence that pre-clinical approaches to TK have not progressed much beyond earlier bioprospecting for pharmaceutical drug discovery. Traditional medicine systems are known for holistic practices shaped by social and cultural context and philosophy extending beyond direct biological interventions all of which produce a complexity in treatments that cannot necessarily be reduced to a pharmacological action (Jansen et al., 2021;

Leonti, 2013). The difficulty in translating such complexity into pharmaceutical drugs has previously been suggested as a reason for the relatively low returns from bioprospecting endeavours (Cordell, 2000).

While research methods increasingly employ more systems-based analyses of complex traditional medicine products such as herbs (Leonti, 2013), drug-discovery research still arguably neglects the wider context of traditional medicine systems and fails to capture the true nature of the TK (Jansen et al., 2021; Leonti, 2013). Indeed, only a handful of the reviewed studies made explicit attempts to maintain fidelity beyond individual treatments to the overarching tradition of the medicine under study (Brosnan, 2016; Flatt, 2016; Harrison et al., 2015; Willcox et al., 2015; Zargaran et al., 2016). These studies sought to translate and adapt evidence from TK while facilitating a deliberate attempt to stay true to the philosophical basis and practices of the traditions they examined. While this level of attention to fidelity was limited, other studies sought compromise between the traditional basis of TK and its alignment with contemporary science by triangulating TK with scientific research (Adams et al., 2009; Buentzel et al., 2020; Flatt, 2016; Gerontakos et al., 2021; Guo-Jing et al., 2020; Harrison et al., 2015; Lumlerdkij et al., 2018; Yao et al., 2021; Zhang et al., 2014) and/or seeking opinions from TK experts regarding scientific findings (Brien et al., 2012; Chen et al., 2015; Fatali, Emami, et al., 2020; Guo-Jing et al., 2020; Kasiri-Martino & Bright, 2016; Wang et al., 2017; Yao et al., 2018, 2021). The pre-clinical studies included in the review all addressed bacterial infections using recipes described in traditional texts (e.g., Bald's Leechbook) (Connelly et al., 2020; Harrison et al., 2015; Kadam et al., 2020; Watkins et al., 2012). These studies clearly aligned with traditional practice through fidelity to the original recipe described by the premodern doctors and scientists, adapting the recipes only as necessary to the context of contemporary scientific research. An interesting finding across these studies was the demonstration of molecular synergy, where molecules across multiple recipe parts needed to be administered together to show the greatest effect on bacterial infections; a 'whole is greater than the sum of all parts' concept common to many traditional medical systems. The adaptation of TK to pre-clinical research presents a powerful model with the potential to help us understand synergy on a molecular level linked to individual (e.g., bacterial infection) or extended contexts (e.g., wound healing).

The differing approaches to aspects of ethics and fidelity in the reviewed literature indicate differences in what is compromised for the sake of pragmatism. These differences are evidenced in tensions around balancing epistemic and gnostic considerations from the dominant paradigms of scientific and TK sources. It was, however, consistently acknowledged that challenges regarding the translation of TK across languages, cultures, philosophies and time need to be addressed in order to maintain the validity of TK (Adams et al., 2009, 2011; Adams, Schneider, et al., 2012; Birch & Sherman, 1999; Choi et al., 2015; De Vos, 2010; Han et al., 2017; Jaric et al., 2014; Kadam et al., 2020; Lardos et al., 2011; Pak et al., 2016; Park et al., 2018; Petran et al., 2020; Sahranavard et al., 2014; Thomas, 2011; Watkins et al., 2012). The actual and perceived efficacy of practices arising from TK can be impacted when the knowledge is abstracted or simplified during translation, as well as in cases where dosing and delivery methods are altered (Jansen et al., 2021). Accordingly, research that seeks to adapt TK to contemporary settings may require a greater level of attention to fidelity and accurate knowledge translation to avoid interfering with the therapeutic potential of traditional medicines during adaptation (Jansen et al., 2021).

Ethical issues regarding environmental and socioeconomic sustainability also arise from approaches motivated by drug-discovery, as do concerns regarding the ethics of intellectual property (Castree, 2003; Rose et al., 2012). While the exploration of natural resources has the potential to identify solutions to problems arising from climate change and shifts in socioeconomic needs (Purkayastha, 2016; Vuong et al., 2022), it is essential that bioprospecting be accompanied by safeguards to ensure environmental responsibility and protection of intellectual property rights. For example, the patenting of natural products used in traditional medicine systems has been argued to infringe upon the intellectual property rights of indigenous people and incentivises the commoditisation of natural resources which can lead to environmental exploitation or damage (Das, 2020; McGonigle, 2016). While guidelines relating to bioprospecting highlight the importance of addressing factors such as environmental impact, equitable benefit sharing and recognition of IP held by indigenous groups and other traditional communities (Soejarto et al., 2005), reality can fall short of these goals (Amusan, 2008; Rose et al., 2012). Our review suggests that these factors are rarely considered, with only one study including environmental sustainability as a criterion for selecting TK (Watkins et al., 2012) and a second study giving attention to IP rights, cultural impact and economic benefit to indigenous custodians of the TK (Willcox et al., 2015). There is an urgent need to improve the uptake and implementation of ethical practice in TK research.

The vast majority of reviewed studies focussed on research questions relevant to practice or research contexts, with little consideration of adaptation of TK to education or policy applications. The apparent lack of

attention to education and policy may present a barrier to the implementation of valuable TK. Effective implementation processes rely on multi-disciplinary collaboration across all stakeholder groups involved in health care, from basic science researchers to policy-makers (Rapport et al., 2018) and this may be difficult to achieve with a dearth of evidence for TK translation in many of these fields. This dearth may particularly impact upon stakeholders involved in knowledge mobilisation that occurs outside of clinical settings, such as educators, information scientists and health science librarians. The findings of this review provide such stakeholders with insight and foundational guidance in bridging TK with contemporary health policy and standards of practice. Addressing educational and policy related factors alongside research and practice to harness '*the potential contribution of traditional medicine to health, wellness and people-centred health care*' is central to WHO's Traditional Medicine Strategy, which informs policy development for WHO member states (World Health Organization, 2013).

Another notable absence in the literature related to methodological reporting. Specifically, the quality appraisal of TK as a source of evidence appears largely overlooked in the contemporary peer-reviewed literature with most studies providing only sparse information regarding how and why specific TK was considered, assessed or selected. That so many of the screened articles were identified through citation tracking ($n = 1087$, or 8% of total) and reference lists ($n = 4431$, or 33% of total) may be due to the implicit, inconsistent nature of reporting on these aspects of research involving TK by affecting searchability. Our study highlights an apparent disconnect between researcher and policy-maker interest in TK—growing recognition and incorporation of the importance of TK in contemporary health care policy implementation is not being matched by commensurate interest or activity among the research community. This suggests a need for a framework for critical appraisal of TK in research and reporting guidelines on how TK is applied in research settings. By promoting transparency and rigour, resources to direct critical appraisal of TK and reporting on its use would benefit not only researchers and policy-makers, but all stakeholders invested in the translation or mobilisation of TK, including health science practitioners, educators, librarians and information scientists.

Limitations

While this review provides valuable novel insight into prevailing processes of translation and adaptation of TK, the findings must be considered alongside study limitations. The review required identification of criteria not consistently reported in the literature, which introduced an interpretive element to the nature of the review and a subjective element to data synthesis. Mitigation of subjectivity was approached through use of a screening checklist, extraction template and synthesis framework to encourage consistency between two reviewers who made decisions by consensus. Subjectivity was also present in the process for critical appraisal, particularly in relation to assessment of the authority of article authors on the tradition and context, which presents an entry point for potential bias. While subjectivity was reduced by using consensus-based decision-making, this limitation must be considered when interpreting related findings. This method of appraisal was applied in the absence of a more suitable approach or tool, further highlighting our call in the previous section of this paper for frameworks and reporting guidelines for TK use.

It is also likely this review is not exhaustive, limiting generalisability, due to the heterogeneous definitions applied in the field of T&CM and absence of explicit reporting of criteria. Exhaustiveness may also be affected by the limited currency of the literature search, which was completed in May 2021. However, as the review topic was found to be poorly indexed and to have received little researcher attention in both investigation and reporting, we argue it is highly unlikely that an update of the search would yield any new findings at this time. We have prioritised publication of these findings in the interests of presenting a comprehensive review that responds in a timely manner to the World Health Organization's (2018) call for methods to support translation of TK into contemporary use.

Additionally, as the review sought to examine original research, data were only taken from the methods and results sections of reviewed articles, which resulted in the exclusion of some studies which may have discussed selection or appraisal of TK more explicitly in the introduction or discussion sections. The location of such information should be considered in any future attempts to develop reporting guidelines for TK research. Future research could shed further clarity around the selection, evaluation and application of TK through inquiry with relevant stakeholders in health care to determine appropriate and effective pathways to implementation.

CONCLUSION

Despite TK's longstanding use in the health systems of many countries, and well-established recognition as a potential source of therapeutic agents, only recently has

the complexity of TK in the approaches to overall health of an individual been appreciated across practice, research, policy and education. Our review clearly shows that this complexity, coupled with unclear guidelines on how to report TK use, has led to the limited implementation of TK across these areas. While the review presented in this paper captures studies using a range of research methodologies and spanning the fields of science, policy and education, it also shows studies mostly address exploration and preparation phases of the aligned EPIS framework. One example of this limited alignment lies in the dominance of pre-clinical studies that use TK primarily as a backdrop for drug discovery. While the hindrance of TK alignment with scientific discovery can be attributed to the limitations in current scientific models and lack of premodern science and history in contemporary science education, integration of TK into practice, policy, education and research linked to clinical outcomes also appears limited. The WHO Traditional Medicine Strategy and Astana Declaration are clear on the importance of integrating traditional and cultural perspectives into contemporary clinical practice—from research *to* education *to* clinic. However, our review clearly shows most researchers address TK superficially, and that only a fraction of incorporated studies align with implementation and sustainment phases of the EPIS framework.

Ultimately, the global majority (especially in low- and middle-income countries) partly or exclusively depend upon TK-informed T&CM for their health care. Yet the implementation of TK into contemporary settings appears to be under-valued and fraught with translational gaps. Researchers need to undertake further work to understand and address such gaps to inform and develop clear translation and evaluation guidelines and standardised reporting framework for TK use across practice, policy, research and education. Implementation science is ideally placed to remain sensitive to the cultural and social influences unique to T&CM perspectives, practices and knowledge systems while applying rigorous methodology that subjects TK to systematic critical investigation in pursuit of optimal health outcomes for all.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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SUPPORTING INFORMATION

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APPENDIX: Screening framework checklist applied during study selection

Screening framework checklist	
1.	Original research (e.g., research article, thesis/dissertation, grey literature reporting on original research)
2.	True to nature of TK (e.g., not bioprospecting, moving away from authentic application of TK)
3.	Contemporary context (positions TK within a context contemporary to the author's time at writing)
4.	Selection/evaluation/application of TK to: Practice Education Research Policy
5.	Uses or argues for use of criteria related to: Validity of evidence Applicability of evidence Quality reporting Safety implications Plausibility/logic/rationale Ethics Other