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Use of Intervention Mapping to enhance healthcare professional practice: a systematic review

Background: Intervention Mapping is a systematic planning protocol for developing behavior change interventions, the first three steps of which are intended to establish the foundations and rationales of such interventions. **Aim:** This systematic review aimed to identify previous programs that used Intervention Mapping to plan changes in healthcare professional practice. Specifically, it provides an analysis of the information provided by the programs in the first three steps of the protocol to determine their theoretical foundations and rationales of change. **Methods:** A literature search was undertaken in PubMed, Scopus, Scielo, and DOAJ using "Intervention Mapping" as keyword. Key information was gathered, including theories used, determinants of practice, research methodologies, theory-based methods and practical applications. **Results:** Seventeen programs aimed at changing a range of healthcare professional practices were included. The social cognitive theory and the theory of planned behavior were the most frequently used frameworks in driving change within healthcare practices. Programs used a large variety of research methodologies to identify determinants of practice, both at the healthcare professional and the environmental levels. Specific theory-based methods (e.g., modelling and active learning) and practical applications (e.g., healthcare professional training and facilitation) were reported to inform the development of practice change interventions and programs. **Discussion:** In practice, Intervention Mapping delineates a 3-step systematic, theory- and evidence-driven process for establishing the theoretical foundations and rationales underpinning change in healthcare professional practice. **Conclusion:** The use of Intervention Mapping can provide healthcare planners with useful guidelines for the theoretical development of practice change interventions and programs.

Key words: Intervention Mapping; behavior change intervention; healthcare professional practice; determinants of practice; health planning

Introduction

Healthcare professional practices must make frequent changes to integrate new recommendations, improve the quality of patient care, and achieve better outcomes (Craig et al., 2008). However, changing established human behaviors, such as those employed in healthcare, can be difficult for a number of reasons. These include individuals' capacities for change, their attitudes and motivations, the availability of financial and regulatory support, and the influences of the social environment, etc. (National Institute for Health and Clinical Excellence, 2007; Grimshaw, Eccles, Walker, & Thomas, 2002). Flottorp et al. (2013) considered any reasons or circumstances *'that might prevent or enable improvements in healthcare professional practice'* to be determinants of practices. Assessing and understanding the determinants that influence a particular professional practice is a key early step in developing appropriate interventions for behavioral change and eventually achieving desired practice adjustments (National Institute for Health and Clinical Excellence, 2007; Michie, van Stralen, & West, 2011).

Changes in healthcare professional practice require exhaustive planning to increase the probability that they are successfully and sustainably implemented (Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008; Michie et al., 2011). Existing frameworks for health program planning provide robust guidelines for developing, implementing and evaluating interventions aimed at changing individuals' behaviors and, thus, promoting change in healthcare professional practices (McKenzie, Neiger, & Thackeray, 2013). One of the most well-known frameworks for health program planning is Intervention Mapping (Bartholomew et al., 2016). Intervention Mapping is a systematic planning protocol for developing behavioral-change interventions. It encompasses six steps, each of which comprises a clear set of tasks. Importantly, this protocol adopts three approaches that are applied throughout the intervention planning process to enhance

its effectiveness and implementation. Specifically, these approaches are: 1) a theory- and evidence-based approach, which encourages the use of relevant theories and empirical evidence to inform the development, implementation and evaluation of behavioral-change interventions; 2) a collaborative approach, which encourages all stakeholders involved in a particular behavioral-change intervention to be engaged with, and involved in, all aspects of decision-making during the planning process; 3) an ecological approach, which encourages a comprehensive assessment of the complex systems into which interventions are integrated, and targeting of any factor that, within that context, can facilitate or hinder the interventions' outcomes. Following on from the ecological approach, Intervention Mapping stimulates the development of interventions that promote behavioral changes at different levels concurrently (individual, interpersonal, organizational, community, and societal) to achieve shared, health-related goals (i.e., all the developed interventions constitute a health program) (Kok, Gottlieb, Commers, & Smerecnik, 2008).

Intervention Mapping highlights the importance of early groundwork and research (i.e., conducted in planning Steps 1 to 3) for increasing the chances that behavioral interventions are effective and implemented into practice successfully. The early planning steps precede the production of specific program components and material (Step 4), the further planning of program implementation (Step 5) and program evaluation (Step 6). Overall, Steps 1 to 3 aim to establish the theoretical foundations of change, or the rationale behind behavioral change interventions (i.e., the ways in which interventions are intended to change individuals' behaviors). They encompass: 1) conducting a problem analysis to identify which behaviors and behavioral determinants need to be changed, and for whom; 2) creating a 'matrix of change objectives', which comprehensively describes the specific changes that are being aimed for, in

both individuals' behaviors (i.e., performance objectives) and their determinants; and 3) selecting appropriate theory-based methods (i.e., behavioral-change methods or techniques; (Kok et al., 2016) to promote changes in behavioral determinants, and translating these methods into practical applications. When translating theory-based methods into practical applications, it is crucial to satisfy both the parameters for effectiveness of each selected method, and to suitably tailor the applications to the intervention population and implementation context (Kok, 2014; Kok et al., 2016).

There has been some research on the use of Intervention Mapping for enhancing healthcare professional practice (Bartholomew et al., 2009; Morgenstern et al., 2002; Sassen et al., 2012); however, no systematic review of it exists. Identifying and synthesizing previous research facilitates the understanding of existing knowledge and may also avoid research being duplicated. Particularly, the groundwork and research conducted in Steps 1 to 3 provide relevant insights into the rationales and decisions made to change a particular healthcare practice. This information is crucial for assessing whether an existing intervention or program can be adapted to similar settings. Lastly, information from previous experiences with Intervention Mapping can foster learning and guide the early planning groundwork and research that other planners need to conduct to change healthcare professional practice in their own setting. Therefore, this systematic review aimed to: 1) identify previous programs that used Intervention Mapping to plan changes in healthcare professional practice, and 2) analyze the level of detail provided by the programs (in steps 1 to 3) to support their theoretical foundations of change and rationales.

Methods

A literature search was undertaken in May 2015 in 4 electronic databases (PubMed/Medline, Scopus, SciELO and Directory of Open Access Journals) using "Intervention Mapping" as the keyword. Also reviewed was the list of health programs provided in the book *'Planning health promotion programs: An Intervention Mapping approach'* (Chapter 3; 3rd ed.; Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011). This book was the primary reference for Intervention Mapping when the review was conducted. The reference lists of the articles used for this research were also explored to search for additional relevant citations.

Screening and eligibility criteria. Titles and abstracts of the retrieved references were screened to exclude conference communications, books, theoretical articles (i.e., not describing an actual intervention/program), articles on interventions/programs unrelated to healthcare practice, and articles not in English, French, Italian, Portuguese or Spanish languages. The full texts of the remaining articles were reviewed to identify reports that described at least one of the three first steps of Intervention Mapping. Articles were excluded if they did not clearly state aims of changing healthcare professional practice, or if changes in practice were not aimed at improving patient care or health.

Data extraction and analysis. A data extraction tool was developed based on the set of tasks set out in Steps 1, 2 and 3 of the Intervention Mapping protocol (Bartholomew et al., 2016). The initial version of the tool was tested and adjusted using a comprehensive case study reported in *'Planning health promotion programs: An Intervention Mapping approach'* (Bartholomew et al, 2011), and a sample of five selected relevant articles. As a result of the testing process, some items included in the original version of the tool were eliminated due to inconsistency or lack of information in the selected articles. Particularly, the removed information related to: 1) the involvement of stakeholders in the planning process (i.e., collaborative approach), 2) theory-

based methods and practical applications addressing the environment of healthcare professionals (i.e., ecological approach), and 3) appropriate translations of theoretical methods into practical applications. Table 1 shows the final set of 15 items included in the data extraction tool. Programs received a score based on the number of items reported by the authors for Steps 1 to 3. When clear information regarding an item was reported, 2 points were assigned to it (see Table 1 for the criteria). Conversely, when no information was provided, 0 points were assigned. Where information was incomplete, unclear, or not reported according to the Intervention Mapping directives, 1 point was assigned.

Results

A total of 278 citations were retrieved and 156 full-text articles were reviewed after screening titles and abstracts (Figure 1). Eventually, 17 articles were retained. These addressed 17 programs that used Intervention Mapping to change healthcare professional practice. One of the articles (Morgenstern et al., 2002) addressed the same program that was extensively described in the Intervention Mapping book. An additional set of 17 articles was retrieved after searching the references from the retained articles. This set did not report any additional programs but provided further description of the original 17 programs.

The programs reported by the articles targeted a wide range of healthcare professionals, health problems and populations (Table 2). The changes they employed addressed a variety of care processes (e.g., assessment of patient needs, disease screening and management, use/adherence to clinical guidelines/evidence-based recommendations, educational support to patients, etc.), coordination, collaboration and communication between healthcare professionals, or communication between professionals and patients.

All health programs except the one reported by Weiland (2013) were reported to use at least one theory to explain and predict the intended changes in healthcare professional practice. In total, 13 theories were identified, the most frequent being social cognitive theory (reported by 6 studies; Bartholomew et al., 2009; Rutten et al., 2014; Hesselink et al., 2014; Leshabari, Koniz-Booher, Astrom, de Paoli, & Moland, 2006; Morgenstern et al., 2002; Robben et al., 2012) and the theory of planned behavior (reported by 5 studies; Cassista, Payne-Gagnon, Martel, & Gagnon, 2014; Rutten et al., 2014; Morgenstern et al., 2002; Sassen et al., 2012; Schmid, Andersen, Kent, Williams, & Damush, 2010); while Morgenstern et al. (2002) used both of these.

Table 3 summarizes the information reported by each program regarding Steps 1 to 3 of Intervention Mapping. Only one program provided a full description about all the groundwork and research conducted in these early planning steps (score=16), while only three failed to report information regarding one of the analyzed items (score=14-15). At the other end of the spectrum, seven programs did not provide clear information on four or more of the analyzed items (i.e., programs scoring ≤ 8 points).

- Regarding Step 1, nine out of the 17 programs included information about the identified determinants and the research methodologies used for that purpose. Determinants of healthcare professional practice were identified at both the individual level (e.g., healthcare professionals' knowledge, skills, attitudes, etc.) and the environmental level (e.g., organizational structure and financial support, practice regulation, availability of technical resources, professional interaction, etc.). Several research methodologies were used to inform this step, including reviews of the literature (n = 5), surveys (n = 4) and focus groups (n = 3). Six programs combined two or more research methodologies to identify determinants of practice (Hesselink et al., 2014; Koekkoek, van Meijel, Schene, &

Hutschemaekers, 2010; Leshabari, Koniz-Booher, Astrom, de Paoli, & Moland, 2006; Rutten et al., 2014; Weiland et al., 2013; Wheeler, Fowler, & Hattingh, 2013). Koekkoek, van Meijel, Schene, & Hutschemaekers (2010) reported the largest number of methodologies: literature review, interviews, survey and Delphi exercise.

- Only four programs reported all the items delineated in Step 2, which focuses on comprehensively describing the changes to be achieved by the program. Importantly, 'matrices of change objectives', postulating the changes intended at the individual healthcare professional level, were used in only eight programs.
- Only four programs reported information for the three items analyzed in Step 3. With regards to the 11 programs that provided data about the theory-based methods used, modelling (reported by seven programs), active learning (n = 4), feedback (n = 4), and reinforcement (n = 4) were the most frequently used. A wide range of practical applications aimed at individual healthcare professionals were reported by nine of the programs, including ongoing training; assessment and feedback on professional performance; provision of financial disincentives for not implementing changes; and facilitation.

Discussion

This review synthesizes available information on the use of Intervention Mapping for planning changes in healthcare professional practice. It provides an important source of information on existing interventions and programs that healthcare planners can adapt to their own settings to improve care practice. This may help to optimize future planning efforts, avoid repetition of non-beneficial actions, and avoid wasting resources.

The programs analyzed in this review generally delineated a three-step systematic process for establishing the theoretical foundation and rationales for changing a healthcare professional practice (Figure 2). Most of the programs gave special attention to analyzing the determinants of practice at the outset of the planning process, which is considered a crucial primary step in informing both the type and content of behavioral-change interventions (Baker et al., 2015; Grol & Wensing, 2004; Michie et al., 2011). Determinants of practice were investigated using different research methodologies and were shown to be related to either the individual healthcare professional or to their external environment. It has been argued that a combination of several research methodologies is the best way to identify large numbers of determinants (Bosch, van der Weijden, Wensing, & Grol, 2007; Krause et al., 2014); however, it is not clear which methodologies are most appropriate for identifying which determinants are most relevant to the situation, and most amenable to being addressed (Baker et al., 2015). Importantly, the development of interventions and/or programs was rooted in relevant frameworks, such as social cognitive theory (Bandura, 1986) and the theory of planned behavior (Ajzen, 1991). These socio-cognitive theories have previously been shown to be useful in explaining the intentions and behavioral patterns of healthcare professionals, and so have become widely used to design interventions to change care practice (Godin et al., 2008; Presseau et al., 2014; Short, James, & Plotnikoff, 2013).

Implications for Practice. In general, the analyzed programs failed to comprehensively report their theoretical foundations and rationales for changing healthcare practice. This is a frequent issue identified in the health service literature that may have important consequences for both research and practice (Baker et al., 2015; Kok et al., 2016; Michie, Fixsen, Grimshaw, & Eccles, 2009; Sabater-Hernández et al., 2016). The theoretical foundations underlying practice-change

interventions/programs provide key information on: 1) the expected effects of the intervention/program; 2) how the intervention/program is meant to work; and 3) why the intervention/program adopts a certain form. All of these are essential to understanding the relevance of an intervention/program in other contexts, the ways in which it can be adapted to those contexts, and how it can be adjusted when it does not achieve its aim. Apart from the shortcomings identified in Table 2, which show that program rationales are usually incompletely reported, five other main concerns have emerged from the analysis:

- Limited, and usually random, information was provided (for Steps 2 and 3) on the contexts and environments in which healthcare professionals worked (i.e., ecological approach). Only a few programs, such as the ALLHAT Dissemination Project (Bartholomew et al., 2009), were clear about their aims for changing healthcare professionals' environments, and the ways in which those changes were expected to influence practices. Targeting environmental determinants and the external agents who influence them (e.g., policy makers, practice managers) is crucial for creating an environment that supports change (Kok, 2014). In other words, changes in healthcare practice require multilevel programs that include interventions directly targeting individual healthcare professionals and the creation of supportive environments. Therefore, further information is needed to understand exactly what was changed (i.e., specific environmental determinants and the agents targeted) and how was it done (i.e., the theoretical or practical methods used).
- Stakeholder involvement (i.e., collaborative approaches) was poorly described, with few reports, such as those of McEwen et al. (2015) and Heinen et al. (2006), providing an acceptable amount of information on the composition of program planning groups. Beyond that, it was uncertain how stakeholders were involved and how they informed the decisions

made throughout the intervention development process. For example, how did they select the theory-based methods or adapt the practical application to the population and context?

- As recently argued in a Cochrane review by Baker et al. (2015), little mention is made of the rationales used to prioritize the determinants targeted by interventions. Likewise neglected is the selection of the specific theory-based methods used to promote change in those determinants.
- Generally, it was unclear how theory-based methods were linked to practice, whether the practical applications satisfied the parameters for each method or were tailored to the population and context. Also, practical applications were sometimes difficult to interpret; it was sometimes unclear what authors were proposing due to the use of confusing language and imprecise, non-succinct descriptions.
- More explanations and details are needed to clearly understand how theory and evidence were used to inform each of the planning steps; for example, to justify why certain determinants were selected to be targeted by the interventions.

The adoption of standard approaches, such as the Template for Intervention Description and Replication (TIDieR) (Hoffmann et al., 2014) or the Workgroup for Intervention Development and Evaluation Research (WIDER) recommendations (Albrecht, Archibald, Arseneau, & Scott, 2013), may help to formalize the reporting of healthcare practice change programs and aid their adaptation to settings beyond those they were originally developed for. The leading researchers of Intervention Mapping provide clear guidelines on the aspects that need to be considered when reporting on the development of interventions (Kok et al., 2016): 1) the determinants targeted by the intervention; 2) the specific theoretical method(s) used to address each determinant and the parameters that were enlisted; 3) the application(s) for each method; and 4) how the population,

context, and parameters were taken into account when the method was applied. A good example of how to report these aspects can be found in Bartholomew et al. (2016), which includes an extensive description of the development of a health program with educational purposes (TLL Temple Foundation Stroke Project). The inconsistency in the description of health interventions and programs is an acknowledged matter that, when comprehensively evaluated, allows for developing suitable guidelines aimed at enhancing the transparency and quality of health research (Correr et al., 2013; Rotta et al., 2015). Along these lines, the issues identified in this research can be considered along with the aforementioned recommendations to develop specific reporting guidelines aimed at better reporting healthcare practice change programs.

Evidently, this review has been affected by the limited information available in the reviewed studies. It is important to note that another 66 articles involving healthcare practice change (as determined from their full texts) were excluded due to their complete absence of information in this regard (Figure 1). Generally, these articles described only the behavioral changes required by the individuals affected by a particular health problem (i.e., patients) without describing associated changes in healthcare practice that were also intended. Our analysis of articles with regards to Steps 1 to 3 of Intervention Mapping was mainly limited to assessing whether the key tasks comprising each step were performed in the studies. The methodological quality of the research conducted with those steps was not assessed and, therefore, nor was the validity of their results. For this reason, no specific details from the programs (e.g., identified determinants of practice) are shown. Assessing the quality of the diverse research reported within the 17 reviewed articles would require extensive expertise in a range of research disciplines. This task would be conducted by other researchers or planners that can assess the validity and usefulness of the results of specific programs according to their interest.

Conclusion

Intervention Mapping has been widely used in healthcare settings to plan changes in the behavior and practice of healthcare professionals. This framework delineates a systematic, theory- and evidence-based approach for establishing the rationale underlying programs aimed at changing healthcare practice. Intervention Mapping encourages the use of theory and evidence, which increases the chances that interventions are effective and successfully implemented into practice. Therefore, Intervention Mapping provides health service planners with a useful and robust planning framework that can help them design and achieve changes in healthcare practice in their own settings. However, the theoretical foundations underlying the development of interventions and programs aimed at changing healthcare practice should be better reported in order to enhance their adaptability and translation into practice. Current publication options, including the use of online appendixes, can facilitate a comprehensive description of such interventions and programs.

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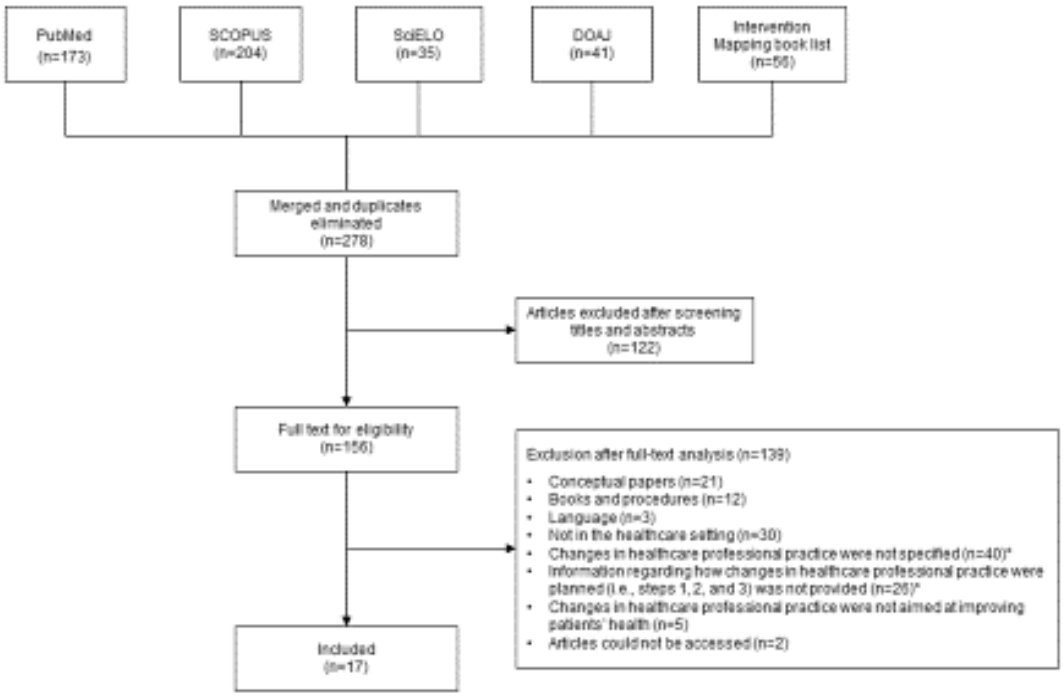
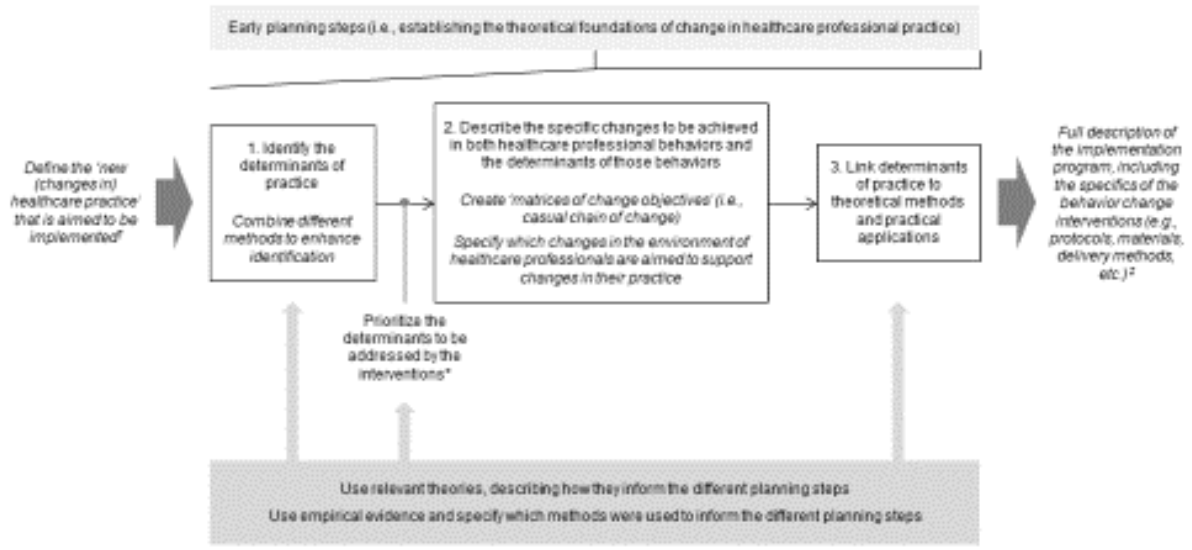
Figure 1. PRISMA diagram



***** Articles that potentially involved changes in healthcare professional practice but were excluded from this review (n = 66)

Figure 2. Early planning steps aimed at establishing the theoretical foundations and rationales for changing healthcare professional practice



† For any intervention seeking to change healthcare professional practice, it is essential to clearly outline such a change at the outset of the planning process (Cadogan, Ryan, & Hughes, 2016).

* Determinants should be prioritized based on their relevance (i.e., strength of the evidence for the causal relationship between the determinant and the expected change) and changeability (i.e., evidence-based likelihood of the determinant being changed by an intervention).

Selected articles that can support operating and reporting the early planning steps:

- Flottorp et al (2013): comprehensive checklist of determinants of practice.
- Krause et al (2014): methods for identifying and selecting determinants of practice.
- Kok (2016): taxonomy of theory-based methods
- Michie, Johnston, Francis, Hardeman, & Eccles (2008): mapping determinants of practice to behavior change techniques (or theory-based methods)
- Michie et al (2011): Behavior Change Wheel (framework to select intervention functions and policies according to behavioral determinants)
- Powell et al (2015): compilation of implementation strategies (or practical applications) and definitions.
- Albrecht et al (2013): WIDER recommendations to improve reporting of the content of behavior change interventions.
- Hoffmann et al (2014): Template for Intervention Description and Replication (TIDieR) checklist.

Table 1. Information extracted from each of the included health programs
Basic information from the included articles and health programs
• Article's year of publication. • Aim of the article (as stated by the authors). • Country where the health program was developed. • Healthcare setting where the health program was developed. • Targeted healthcare professional (i.e., healthcare provider whose practice was meant to be changed). • Aimed changes in healthcare provider practice. • Theories used to plan changes in healthcare professional practice.
Specific information regarding step 1 (Needs assessment)
• Determinants of practice: factors that can prevent or enable improvements in healthcare professional practice. This item was considered to be suitably reported when a comprehensive list of determinants and the methods used for their identification were described.
Specific information regarding step 2 (Matrices of change objectives)
• Performance objectives: specific actions and tasks to be conducted by healthcare professionals as part of the aimed change in practice*. This item was considered to be suitably reported when a comprehensive list of performance objectives was provided. • Selected determinants of practice: specific determinants at the individual healthcare professional level that were considered to be relevant to achieve the aimed changes in practice*. This item was considered to be suitably reported when a comprehensive list of relevant determinants was presented. • Change objectives: specific changes to be achieved in the aforementioned determinants as

an effect of the behavior change interventions*. This item was considered to be suitably reported when a comprehensive list of change objectives was presented.

- Matrices of change objectives for the individual healthcare professional*. This item was considered to be suitably reported when a table (i.e., matrix) that systematically organizes the 3 previous items was presented (i.e., performance objectives in the right-end column; selected determinants in the upper row; change objectives in table's cells).

Specific information regarding step 3 (Theoretical methods and practical applications)

- Targeted determinants of practice: determinants that eventually are targeted by the behavior change interventions to change practice*. This item was considered to be suitably reported when these determinants were clearly specified.
- Theoretical methods: general behavioral change techniques for influencing/driving change in the targeted determinants*. This item was considered to be suitably reported when these theoretical methods were clearly specified.
- Practical applications: applied strategies or techniques used to operationalize theoretical methods into practice and enhance the adoption, implementation and sustainability of the change in healthcare professional practice*. This item was considered to be suitably reported when these practical applications were clearly described.

* Further definitions and explanations regarding these items are available in the book *'Planning health promotion programs: An Intervention Mapping approach'* (Third Edition) (L. K. Bartholomew, Parcel, Kok, & Gottlieb, 2011).

Table 2. Healthcare professionals and practices targeted by the identified health programs			
Health program† and country	Targeted healthcare professionals	Target population	Key elements of healthcare practice that were aimed to be changed/improved
Rutten et al. (2014); Netherlands (Harting, Rutten, Rutten, & Kremers, 2009; Rutten, Kremers, Rutten, & Harting, 2009)	Physical therapists (*)	Patients with low back pain	• Use/adherence to clinical guidelines/evidence-based recommendations • Management of patient information • Assessment and treatment of low back pain • Assessment and treatment of comorbidities (i.e., psychological factors)
Morgenstern et al. (2002); USA (L. K. Bartholomew, Parcel, Kok, & Gottlieb, 2011)	Emergency department staff, emergency medical service staff, primary care providers	Individuals experiencing symptoms of acute ischemic stroke	• Administrative and care processes before patient arrival to the hospital • Use/adherence to clinical guidelines/evidence-based recommendations for acute care • Use of intravenous recombinant tissue plasminogen activator • Educational support to patients at high risk for stroke and office staff in the primary care setting (to early detect and take action against signs of stroke)

Schmid, Andersen, Kent, Williams, & Damush (2010); USA (Damush, Plue, Bakas, Schmid, & Williams, 2007)	Healthcare providers involved in the prevention of stroke in medical centres (i.e., doctors, nurses, occupational-, physical- and recreational therapists, and social workers)	Patients at risk of a secondary stroke	• Assessment and treatment of risk factors for stroke • Educational support (i.e., stroke risk factors and lifestyle habits) • Referral of patients to local programs addressing stroke risk factors
Hesselink et al. (2014); Netherlands, Spain, Poland, Sweden, and Italy (Hesselink et al., 2013; Johnson et al., 2012; Yao et al., 2012)	Hospital care providers responsible for patients' discharge	Patients discharged from hospitals	• Coordination and collaboration between healthcare professionals and services after patients being discharged from hospitals • Communication between healthcare professionals and patients, including the quality of the discharge information
Dera-de Bie, Gerver, & Jansen, (2013);	Physicians and nurses in child healthcare	Children in their first year of life	• Use/adherence to clinical guidelines/evidence-based recommendations to prevent overweight/obesity • Early detection of children at risk for overweight

Netherlands (Dera de Bie, Jansen, & Gerver, 2012)	services		• Communication between healthcare professionals and parents
Leshabari, Koniz-Booher, Astrom, de Paoli, & Moland (2006); Tanzania	Nurses in medical centres	Women with HIV	• Educational support on infant feeding methods (to prevent mother-to-child transmission of HIV)
Bartholomew et al. (2009); USA	Doctors involved in the management of hypertension (*)	Individuals with hypertension	• Adherence to clinical guidelines/evidence-based recommendations for the management of hypertension • Educational support (i.e., use of medicines and lifestyle modification).
Robben et al. (2012); Netherlands	Healthcare professionals involved in the care of frail older people (*)	Frail older individuals	• Coordination and collaboration between healthcare professionals • Assessment of patient needs (i.e., knowledge and self-management) • Involvement of patients in setting goals and shared decision making processes • Educational support to encourage self-management • Patient follow-up (over time)
Koekkoek, van Meijel, Schene, &	Psychiatric clinicians (*)	Individuals with long-term non-	• Inappropriate opinions and attitudes

Hutschemaekers, (2010); Netherlands (Koekkoek, van Meijel, & Hutschemaekers, 2006; Koekkoek, van Meijel, Schene, & Hutschemaekers, 2008; Koekkoek, Hutschemaekers, van Meijel, & Schene, 2011; Koekkoek, van Meijel, Schene, & Hutschemaekers, 2009a; Koekkoek, van Meijel, Tiemens, Schene, & Hutschemaekers,		psychotic disorders	

2011; Koekkoek, et al., 2010; Koekkoek, van Meijel, Schene, & Hutschemaekers, 2009b)			
Sassen et al. (2012); Netherlands (Sassen, Kok, & Vanhees, 2011)	Nurses, physiotherapists (*)	Patients with cardiovascular risk factors	• Assessment of barriers to physical activity • Educational support (i.e., plans to encourage physical activity and overcome barriers) • Patient follow-up (over time)
Cassista, Payne-Gagnon, Martel, & Gagnon (2014); Canada	Nurses in paediatric units in medical centres	Patients using parenteral medication	• Adherence to clinical guidelines/evidence-based recommendations on the use of filter needles.
Heinen, Bartholomew, Wensing, van de Kerkhof, & van Achterberg (2006);	Nurses in dermatology centres	Patients with leg ulcer (users of compression therapy)	• Assessment of patient needs (i.e., knowledge, skills, self-efficacy, barriers and adherence to compression therapy) • Educational support (to enhance the use of compression therapy).

Netherlands (Persoon et al., 2004)			
Weiland et al. (2013); Netherlands (Weiland et al., 2012)	Medical specialists and residents in hospitals	Patients with medically unexplained physical symptoms	• Communication between healthcare professionals
McEwen et al. (2015); Canada	Rehabilitation healthcare professionals in cancer centres	Head and neck cancer survivors	• Assessment of patient rehabilitation needs • Involvement of patients in setting goals and action plans • Educational support (to promote adherence to rehabilitation programs)
Hou, Fernandez, & Parcel (2004); China	Female physicians (*)	Women	• Referral to/delivery of cervical cancer screening services
Fernandez, Gonzales, Tortolero-Luna, Partida, & Bartholomew	Physicians and other healthcare providers (*)	Female farmworkers over 50 years	• Referral to breast and cervical cancer screening service

(2005); USA			
Wheeler, Fowler, & Hattingh (2013); Australia	Community pharmacists and pharmacy support staff	Individuals with anxiety and depression (mental health consumers)	• Involvement in enhancing the use of medication

† To label the health programs, the article that was originally retrieved through the search strategy is used. Besides, the references of any other article related to the programs (i.e., those retrieved by manually searching the references of the originally retrieved article) are provided.

(*) Although authors did not specify any particular setting, it was clearly deduced from the article that the health program was developed in a healthcare setting.

Table 3. Information provided by each of the health programs regarding the fundamentals for changing healthcare provider practice.

	Step 1	Step 2				Step 3			
Health program	Determinants of practice	Performance Objectives	Selected determinants	Change objectives	Matrix of change	Targeted determinants	Theoretical Methods	Practical Applications	Score *
Rutten et al. (2014)[§]; Netherlands (Harting, Rutten, Rutten, & Kremers, 2009; Rutten, Kremers, Rutten, & Harting, 2009)	√	√	√	√	√	√	√	√	16
Morgenstern et al. (2002)[§]; USA (L. K. Bartholomew, Parcel, Kok, & Gottlieb, 2011)	*(M)	√	√	√	√	√	√	√	15

Schmid, Andersen, Kent, Williams, & Damush (2010); USA (Damush, Plue, Bakas, Schmid, & Williams, 2007)		√	√	√	√	√	√	√	14
Hesselink et al. (2014); Netherlands, Spain, Poland, Sweden, and Italy (Hesselink et al., 2013; Johnson et al., 2012; Yao et al., 2012)	√	√	√	√	√		√	√	14
Dera-de Bie, Gerver, & Jansen, (2013); Netherlands (Dera de Bie, Jansen, &		√	√	√	*	√	√	√	13

Gerver, 2012)									
Leshabari, Koniz-Booher, Astrom, de Paoli, & Moland (2006); Tanzania	√	√		√		√	√	√	12
Bartholomew et al. (2009)[§]; USA		√	√	√	√		√	√	12
Robben et al. (2012); Netherlands	√	√	√	√	√		√		12
Koekkoek, van Meijel, Schene, & Hutschemaekers, (2010); Netherlands (Koekkoek, van Meijel, & Hutschemaekers, 2006; Koekkoek,	√	√	√	√	*		√		11

van Meijel, Schene, & Hutschemaekers, 2008; Koekkoek, Hutschemaekers, van Meijel, & Schene, 2011; Koekkoek, van Meijel, Schene, & Hutschemaekers, 2009a; Koekkoek, van Meijel, Tiemens, Schene, & Hutschemaekers, 2011; Koekkoek, et al., 2010; Koekkoek, van Meijel, Schene, & Hutschemaekers, 2009b)									

Sassen et al. (2012)[§‡]; Netherlands (Sassen, Kok, & Vanhees, 2011)	√	√	√	√	√				10
Cassista, Payne-Gagnon, Martel, & Gagnon (2014); Canada	*(M)	√	*			√	√	√	10
Heinen, Bartholomew, Wensing, van de Kerkhof, & van Achterberg (2006)[§‡]; Netherlands (Persoon et al., 2004)		√	√	√	√				8
Weiland et al. (2013);	√	√					√	√	8

Netherlands (Weiland et al., 2012)									
McEwen et al. (2015)[†]; Canada		√	√	√	*				7
Hou, Fernandez, & Parcel (2004)[§]; China		√	√	√					6
Fernandez, Gonzales, Tortolero-Luna, Partida, & Bartholomew (2005)[§‡]; USA		√	√	√					6
Wheeler, Fowler, & Hattingh (2013); Australia	√	√	√						6
(*) The information provided by the authors was incomplete, unclear or not reported as proposed by Intervention Mapping; (M) Authors did not provide a comprehensive list of the determinants of healthcare provider practice but only the methods that they used for assessing such									

determinants; (§) At least one of the co-authors/planners involved in the health program is an author of the Intervention Mapping framework; (†) Step 3 of Intervention Mapping was under progress when this review was conducted; (‡) Information about step 3 was provided by the authors; however the specific information regarding changes in healthcare practice could not be extracted because it was mixed with the information addressing the changes at other levels (e.g., at the patient level, at the organizational level).