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A systematic approach to implementing and evaluating clinical guidelines: The results of fifteen years of Preventive Child Health Care guidelines in the Netherlands

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ABSTRACT

Preventive Child Health Care (PCHC) services are delivered to all children in the Netherlands by approximately 5500 doctors, nurses and doctor's assistants. In 1996, The Dutch Ministry of Health, Welfare and Sports asked for the development of evidence-based PCHC guidelines. Since 1998, twenty-five guidelines have been published. Levels of implementation affect outcomes and so implementation and evaluation of the actual use of guidelines are essential. At the outset, there was a national implementation plan with six main activities: a) determinant analysis before the implementation of a guideline, b) innovation strategies tailored to the determinants, c) dissemination to all professionals, d) ongoing evaluation of the awareness and use of the guidelines, e) trained implementation coordinator(s) in each PCHC organization and f) a national help desk.

The awareness and use of the guidelines in random samples of doctors, nurses and doctor's assistants were surveyed using questionnaires. The respondents stated (on a 7-point scale) the proportion of all children they had exposed to given core elements in a guideline. The aim is for at least 90% of the professionals to be aware of the guideline and for 80% to perform the core elements for all (or nearly all) children. The six main activities, with the exception of ongoing evaluation, were gradually put into place, albeit only gradually, between 1998 and 2015 for all guidelines.

In 2012, the use of individual core elements in all guidelines, dating from before 2012, varied from 28% to 100%. One guideline met both criteria of 90% awareness and 80% use, and three guidelines nearly met these criteria.

Looking back on fifteen years of PCHC guidelines, we may conclude that the guidelines produced recently are implemented in accordance with the national implementation plan. Unfortunately, the evaluation of guideline use continues to be a difficulty.

1. Introduction

1.1. The development of Preventive Child Health Care guidelines

Improving and protecting the health of children is an important social value. Preventive Child Health Care (PCHC) services are therefore offered to all children in the Netherlands from birth to the age of 19 years. These services are free of charge for parents and are delivered by approximately 5500 doctors, nurses and doctor's assistants working in well-baby clinics and in municipal health services, the PCHC organizations, of which there are 50 in the Netherlands. In 1996, for the purposes of quality assurance, the Dutch Ministry of Health, Welfare and Sports requested for the development and implementation of evidence-based PCHC guidelines. The guidelines are indirectly funded by the Ministry, mainly through the Netherlands Organization for Health Research and Development (ZonMw). At the national level, the Dutch Centre for Child Health (NCJ) oversees the development, implementation and evaluation of the guidelines (Dutch Centre for Child Health, 2013). The predecessor of the NCJ was established in 2006 by the Ministry, and currently, the NCJ receives advice from the Guideline Advisory Committee (Fig. 1). The standing members of this Committee are representatives from the professional organizations of doctors, nurses and doctor's assistants

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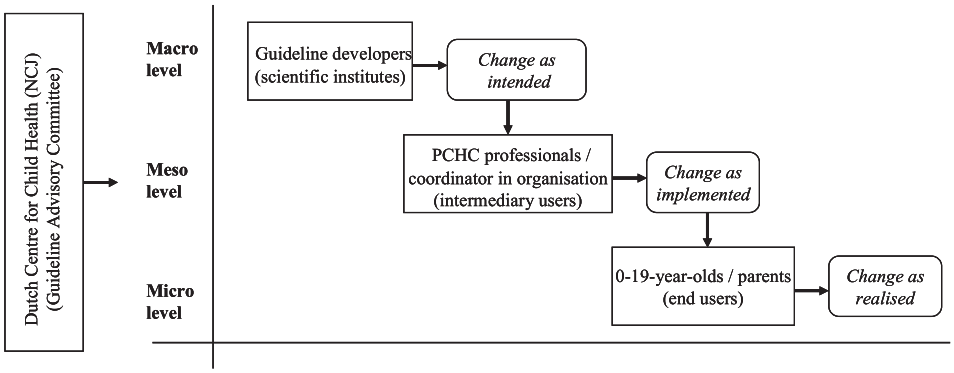

Fig. 1. Infrastructure and main stakeholders in the PCHC guideline process at the macro-, meso- and micro-levels (M. A. H. Fleuren, 2010; Paulussen, 1994).

and the national associations of the PCHC organizations. The Ministry of Health, ZonMw and the Health Care Inspectorate are represented by observing members. Guideline development is the work of several scientific institutes, although always performed in cooperation with the professional organizations and in accord with an evidence-based approach to guideline development (Guyatt et al., 2011; Qaseem et al., 2012; Schunemann et al., 2014).

The PCHC guidelines consist of three documents: the guideline, including a review of the research evidence, a summary of the guideline and an overview/flowchart. The last two documents are used in daily practice. The guidelines have a broadly similar structure: the description of the disorder/problem, history, diagnosis, prevention, treatment and referral. Twenty-five guidelines have been published since 1998 (Table 1) (Dutch Centre for Child Health, 2013). They cover, for example, the early detection of congenital heart disorders, asthma and child abuse.

1.2. General problems with guidelines

In the late 1980s, it became apparent that one of the main problems with the introduction of guidelines is that professionals do not spontaneously use guidelines as intended by the developers (Lomas et al., 1989). Articles titled "Wanted: guidelines that doctors will follow" and "Writing them is easier than making them work" were a wake-up call for many guideline developers (Delamothe, 1993; Haines and Feder, 1992). Similar to most other people, health professionals proved not to be rational actors who used guidelines immediately once they were published. Furthermore, other factors exist that affect the uptake of guidelines and that are beyond the control of individual professionals, such as legislation or available resources (M. Fleuren et al., 2004; M. A. Fleuren et al., 2014; Greenhalgh et al., 2004; Grol et al., 1998; Grol and Grimshaw, 2003). Guideline adherence continues to be challenging (Fixsen et al., 2005; Grimshaw et al., 2006; Grol et al., 2005; Gulbrandsson, 2008; Prior et al., 2008). There is extensive empirical evidence that the level of use of guidelines affects outcomes in clients/patients (Durlak and DuPre, 2008). This means that a substantial proportion of clients/patients will not receive the intended care in such a way that they derive benefit from these guidelines. There appears to be little value in producing guidelines when they are not being used in practice.

The reason for this apparent disconnect is not solely a question of implementation activities; adherence evaluation is also important. We must know whether a guideline has been put into practice by the professionals to determine whether the guideline has helped clients and patients. Otherwise, one may incorrectly assume that the guideline is ineffective in itself when, in fact, it actually has not been properly implemented. This is known as a "Type III error" (Dobson and Cook, 1980; Dusenbury et al., 2003). Data about the guideline use and the associated determinants are also essential for the purposes of adapting the implementation activities and the guidelines themselves in response to these measurements (Durlak and DuPre, 2008; Feldstein and Glasgow, 2008; Fixsen et al., 2005; M. Fleuren et al., 2004; M. A. Fleuren et al., 2014; Greenhalgh et al., 2004). Notwithstanding, many guidelines are neither systematically implemented nor evaluated (Durlak and DuPre, 2008; Fixsen et al., 2005; Greenhalgh et al., 2004). It would not appear useful to develop guidelines without systematically evaluating the implementation process and the outcomes (M. A. H. Fleuren et al., 2010; Kryworuchko et al., 2009). Since 1998, when the first PCHC guideline in the Netherlands was published, we have been integrating development, implementation and evaluation. A comprehensive national implementation plan with six main activities addressing both implementation and evaluation was developed.

The aims of this paper are to describe: a) the extent to which the main activities in the national implementation plan were conducted for each PCHC guideline between 1998 and 2015, and b) a summary of the main outcomes of the evaluation regarding the use of the guidelines.

1.3. Framework for the national implementation plan

Several models have been proposed that describe similar planning sequences for the systematic introduction of innovations, as for example with guidelines, in general terms (Bartholomew et al., 2011; Feldstein and Glasgow, 2008; M. Fleuren et al., 2004; Fullan, 2007; Glasgow et al., 1999; Greenhalgh et al., 2004; Grol and Grimshaw, 2003; Grol et al., 2005). Fig. 2 shows a generic framework that has been put into place to both implement and evaluate the use of the PCHC guidelines (M. Fleuren et al., 2004). The framework has been used for the introduction of innovations in a wide range of settings in Dutch health care (Crone et al., 2006; de Veer et al., 2011; M. A. Fleuren et al., 2012; Kolkman et al., 2013; Vlemmix et al., 2010).

1.3.1. Determinant analysis and innovation strategies

Fig. 2 shows the four main stages in an innovation process. The transition from one stage to the next can be affected positively or negatively by various determinants, which may be categorized depending on their association with the following (M. Fleuren et al., 2004; M. A. Fleuren et al., 2014):

1. the innovation: the PCHC guideline (e.g., complexity, procedural clarity);
2. the potential user of the innovation: the PCHC professional (e.g., knowledge, self-efficacy);

Table 1
Overview of all PCHC guidelines and the extent to which the main activities in the national implementation plan are put into place (or scheduled).

	Year of (expected) publication	Determinant analysis	Innovation strategies[b]		Dissemination[a]	Evaluation and feedback		Implementation coordinators	Help desk
			Training/instruction	Toolkit		Use and determinants	Use		
Hearing disorders	1998	Yes	All professionals		Personal	2001	2012		Developer
Visual disorders	2002	Yes	All professionals		Personal	2005	2012[d]	Yes	Developer
Scoliosis	2003						2012		Developer
Congenital heart disorders	2005	Yes	All professionals/ e-learning		Personal	2006	2012	Yes	Developer
Psychosocial problems	2008				Organization		2012		NCJ
Sudden Infant Death	2009				Organization		2012		NCJ
Family counseling if a child dies	2009				Organization		2012		NCJ
Prevention of child abuse	2010	Yes	All professionals		Personal		2012	Yes	NCJ
Visual disorders *update*	2010	Yes	Train-the-trainer	Yes	Personal		2012	Yes	NCJ
Short stature	2010	Yes	Train-the-trainer/ e-learning	Yes	Website/organization		2012	Yes	NCJ
Toilet training and incontinence	2012	Yes	Train-the-trainer/ e-learning	Yes	Website/organization			Yes	NCJ
Asthma	2012	Yes	Train-the-trainer/ e-learning	Yes	Website/organization			Yes	NCJ
Skin disorders	2012	Yes	Train-the-trainer/ e-learning	Yes	Website/organization			Yes	NCJ
Overweight	2012	Yes	Train-the-trainer[c]	Yes	Website/organization			Yes	NCJ
Plagiocephaly	2012	Yes	Train-the-trainer	Yes	Website/organization			Yes	NCJ
Undescended testis	2013		Train-the-trainer	Yes	Website/organization			Yes	NCJ
Early infant crying	2013		Train-the-trainer[c]/ e-learning	Yes	Website/organization			Yes	NCJ
Premature/small for gestational age	2013	Yes	Train-the-trainer	Yes	Website/organization			Yes	NCJ
Food and eating habits	2013	Yes	Train-the-trainer/ e-learning	Yes	Website/organization			Yes	NCJ
Parenting support	2013	Yes	Train-the-trainer[c]	Yes	Website/organization			Yes	NCJ
Food hypersensitivity	2014	Yes	Train-the-trainer/ e-learning	Yes	Website/organization			Yes	NCJ
Bullying	2014	Yes	Train-the-trainer/ (e-learning)	Yes	Website/organization			Yes	NCJ
Development of sexuality	2014	Yes	(Train-the-trainer)/ (e-learning)	(Yes)	Website/organization			Yes	NCJ
ADHD	2015	Yes	(Train-the-trainer)/ (e-learning)	Yes	Website/organization			(Yes)	NCJ
Autism	2015	Yes	(Train-the-trainer)/ (e-learning)	Yes	Website/organization			(Yes)	NCJ
Breastfeeding	(2015)		(Train-the-trainer)	(Yes)	(Website/organization)			(Yes)	(NCJ)

[a] Personal = sent to each individual professional; organization = sent to organization only; website = published on NCJ website.
[b] All professional/e-learning = face-to-face training or e-learning module offered to each individual professional; train-the-trainer = instruction to implementation trainer who have to pass the instruction on in their own organization.
[c] E-learning module available for motivational interviewing with respect to the overweight, early infant crying and parent support.
[d] The use of the update of this guideline was evaluated, but the core elements/activities hardly differed from those in the 2002 guideline.

3. the organization in which the professional works (e.g., staff turnover, financial resources); and
4. the socio-political context (e.g., legislation).

Ideally, a determinant analysis will be performed before the introduction of a guideline to better target the innovation strategy (M. A. Fleuren et al., 2014; M. A. H. Fleuren, 2010). If a determinant analysis is not conducted and/or the applied innovation strategy does not take the relevant determinants into account, the innovation process may fail (Baker et al., 2015; Bartholomew et al., 2011; M. Fleuren et al., 2004; Greenhalgh et al., 2004; Paulussen, 1994). The applied innovation strategy may focus on determinants that are irrelevant. For example, time constraints were believed to be an important determinant of non-adherence to the first PCHC-guideline on hearing disorders. However, the determinant analysis showed that a major problem was the lack of soundproofed areas in which hearing tests could be performed in schools (M. A. H. Fleuren et al., 2004). Alternatively, the selected strategy may be inappropriate as a way of influencing the relevant determinants. In the case of the hearing disorder guidelines, modeling as an innovation strategy would not have solved the problem described herein.

1.3.2. Evaluating the use of guidelines

To assess the use, and the determinants of use of a guideline, it is necessary to identify first the components that compromise the guideline. As a rule, guideline developers will be explicit about which core elements/activities they believe are critical if a guideline is to be implemented as intended. Determinants of use may differ between core elements/activities and innovation strategies will influence the determinants. Use, and the determinants of use, should therefore be assessed for each core element/activity separately in relation to the innovation strategies to which the PCHC professional is exposed. This may already be accomplished during a pilot implementation with the draft guideline.

1.3.3. Infrastructure

In general, several actor subsystems can be distinguished at the micro-, meso- and macro-levels in innovation processes (Paulussen, 1994). Fig. 1 presents the main stakeholders in the PCHC

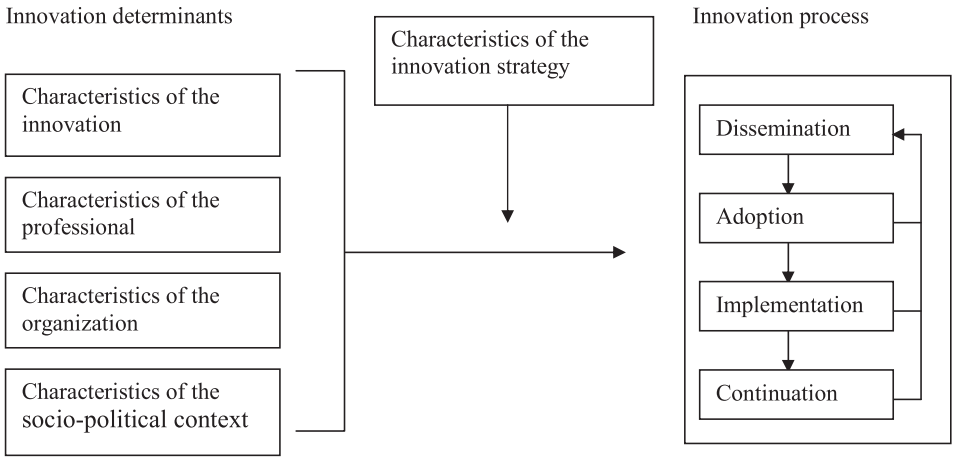

Fig. 2. Framework representing the innovation process and related categories of determinants (M. Fleuren et al., 2004).

guideline process. The end users – the micro-level – are the persons primarily targeted by a guideline. The intermediary users – the meso-level – are the professionals whose actions determine the degree of exposure of end users to the guideline. External developers – the macro-level – will usually design the guideline. For the purposes of delivering the care as described in the PCHC guidelines to all 0–19 year-olds and their parents, it is important to create an infrastructure that connects the various subsystems.

1.3.4. The national implementation plan

The first PCHC guideline was simply dispatched to the relevant organizations. At the same time, at the request of the Ministry, PCHC managers and professionals were consulted about the best approach to introducing the guidelines. The study showed two critical impeding determinants: 1. the lack of an infrastructure in PCHC for disseminating, implementing and evaluating the guidelines and 2. a shortfall in the PCHC organizations with respect to the knowledge and expertise needed for the introduction and evaluation of the guidelines (M. A. H. Fleuren et al., 2002; M. A. H. Fleuren et al., 2004). Examples of the concerns the respondents expressed were: How should we do this? Who will provide for the guidelines? What support can we expect? What are the implications for my organization/for me?

On the basis of the study findings and the frameworks presented in Figs. 1 and 2, a comprehensive national implementation plan was developed (Jong de et al., 2002). The plan was evaluated and refined in 2006 and in 2010 (M. A. H. Fleuren and Jong de, 2006; M. A. H. Fleuren, 2010).

The national implementation plan includes six main activities:

1. *Determinant analyses* should be performed querying both professionals and the management of PCHC organizations about perceived determinants at the four levels. The managers should not be overlooked because formal ratification by management is an important determinant of the actual use of guidelines (M. A. Fleuren et al., 2014).
2. *Innovation strategies adapted to the outcomes of the determinant analysis*. Awareness of the content of the guideline, information about the use of the guideline, the knowledge needed to use the guideline and self-efficacy are some important generic determinants of the actual use of guidelines (M. A. Fleuren et al., 2014). Training related to the content of the guidelines should therefore be offered to all individual professionals, alongside specific innovation strategies that are adapted to the outcomes of the determinant analysis.
3. *Dissemination of the guidelines* to all individual professionals free of charge was issued by the professional organizations (M. A. H. Fleuren et al., 2002).
4. *Evaluation and performance feedback*. Feedback to users about the progress of the innovation process is an important determinant of the actual use of guidelines (Durlak and DuPre, 2008; M. A. Fleuren et al., 2014). The main stakeholders in the PCHC system said that the use, and the determinants of use, of new guidelines should be evaluated approximately two years after publication in a random sample of all PCHC professionals (M. A. H. Fleuren and Jong de, 2006; M. A. H. Fleuren, 2010; Jong de et al., 2002). Furthermore, systematic monitoring of the ongoing use of guidelines was deemed necessary.
5. *Implementation coordinators and infrastructure*. The presence of one or more persons responsible for introducing the guidelines in their own organization is a determinant of the actual use of guidelines (M. A. Fleuren et al., 2014; M. A. H. Fleuren et al., 2004). Each organization should therefore have at least one implementation coordinator who should be trained to fulfill this role. The coordinators have an important role in the infrastructure by connecting several subsystems (Fig. 1).
6. *A national help desk* is required to answer questions from individual professionals or organizations about the use and/or content of the guidelines.

2. Methods

2.1. Activities regarding the national implementation plan

The implementation plan was evaluated in 2006 and in 2010 on the basis of interviews with PCHC professionals, managers and the main stakeholders at the national level (the professional organizations, the national associations of the PCHC organizations, the Ministry of Health, Welfare and Sport, ZonMw and the Health Care Inspectorate) (M. A. H. Fleuren and Jong de, 2006; M. A. H. Fleuren, 2010). As an ongoing activity, the NCJ maintains records of the various activities being performed.

2.2. Evaluation of use

2.2.1. Participants and design

The aim of the studies was to assess the use of the core elements of the guidelines and the associated determinants. For each guideline, a cross-sectional study was conducted of nationally representative samples of PCHC professionals (Table 1). Three

studies assessed the guidelines on hearing disorders, visual disorders and congenital heart disorders (M. A. H. Fleuren et al., 2002; M. A. H. Fleuren et al., 2006; M. A. H. Fleuren et al., 2007). In 2012, the use of all guidelines published before 2012 was evaluated (Lanting et al., 2013).

Questionnaires were sent to the managers/implementation coordinators of all PCHC organizations, who were then asked to distribute the questionnaire to a representative sample of doctors, nurses and doctor's assistants. To obtain a representative sample, its distribution was related to the size of organizations and the proportion of doctors, nurses and doctor's assistants within each organization. The managers/implementation coordinators were asked to distribute a questionnaire to every second, third or fourth professional, depending on the number of professionals per discipline, in alphabetical order of their last names. Organizations that returned fewer than half of the questionnaires were phoned after six weeks, whereas the others received a postal reminder.

The guidelines regarding hearing disorders, visual disorders and congenital heart disorders were studied twice. Both use and determinants of use were evaluated in the cases of the guidelines for visual disorders and congenital heart disorders (Table 1).

2.2.2. Ethical approval

According to the Dutch Medical Research Involving Human Subjects Act, the studies did not require ethical approval, as questionnaire-based studies with PCHC professionals were used and without patient involvement. Study participation was voluntary. The responses were anonymous and non-traceable to individuals.

2.2.3. Measures

For each guideline, a panel of between four and six guideline developers/experts selected a subset of the core elements/activities. These elements/activities are considered as the most important/critical for the use of the guideline and may be considered of as performance indicators.

The use of the core elements/activities of the guidelines was assessed in all studies in a similar way. First, the respondents were asked about “awareness”, what is, whether they knew that the guideline existed (yes/no). The respondents who replied positively were asked to indicate on a 7-point Likert scale how many children they had exposed to each core element/activity. The possible answers ranged from “no child at all” to “all children”. All answers were self-reported.

Determinants of use were derived from several theories (Bartholomew et al., 2011), such as the Theory of Planned Behavior (Ajzen, 1991), the Social Cognitive Theory (Bandura, 1986), the Diffusion of Innovation Theory (Rogers, 2003) or the ASE model (De Vries et al., 1995; De Vries et al., 1988). The determinants measured related to innovation characteristics (such as procedural clarity, complexity, compatibility, completeness), professional characteristics (for example, self-efficacy, subjective norm, outcome expectations, personal benefits/drawbacks, descriptive norm, social support), and organizational or socio-political characteristics (exemplified by formal ratification by management, an implementation coordinator, financial resources, available time, performance feedback, material resources and facilities).

2.2.4. Analysis

Response rates between organizations such as well-baby clinics and municipal health services, and within organizations, such as between disciplines – were statistically tested using Chi-square tests.

The aim is for at least 90% of the professionals to be aware of the guideline and for 80% to perform each core element/activity for all (or nearly all) children. These criteria are considered to be relevant because the professionals are expected to provide most activities in the guidelines to all children in the country. These criteria have also been adopted as a baseline tenet of further research into the use and the determinants of use of specific guidelines.

Our first step was to dichotomize the variable “use” into “provide to all (or nearly all) children” and the other five categories. The “mean level of use” was then assessed as the proportion of the total number of prescribed core elements/activities the professionals had actually put into practice for “all (or nearly all) children”. Descriptive statistics for awareness, the use of individual core elements/activities (range) and the mean level of use were tabulated as the means. Differences in awareness and the mean level of use between and within organizations were analyzed.

Differences over time in awareness and use were assessed using Chi-square testing in the case of guidelines that were evaluated twice. The previous studies of guidelines for visual disorders and congenital heart disorders evaluated more core elements/activities than the 2012 study. Only those core elements that were measured in all of the studies were compared (four elements for visual disorders and six for congenital heart disorders). More strict criteria were used because of the small numbers of core elements involved. The percentage of professionals who had applied all core elements/activities for “all (or nearly all) children” was calculated and compared over time.

Determinants of the use of the individual core elements/activities were evaluated for the guidelines on visual disorders and congenital heart disorders (Table 1) (M. A. H. Fleuren et al., 2006; M. A. H. Fleuren et al., 2007). In 2012, we pooled the original data from eight empirical studies of the implementation of evidence-based innovations in preventive child health care and schools to assess which determinants “predict” the use of innovations in general (M. A. Fleuren et al., 2014). Five of these studies concerned the implementation of PCHC guidelines/programs. A multivariate linear regression analysis was performed, using only the data of the five PCHC studies to assess the determinants that best explain the adherence.

SPSS (version 20) was used for analysis. A two-sided α of 0.05 was adopted as the significance level.

3. Results

3.1. Activities regarding the national implementation plan

Table 1 shows the extent to which the six main activities were performed for each guideline between 1998 and 2013.

1. *Determinant analysis*. Determinant analyses have been performed for nearly all guidelines. In the pilot implementation phase, the draft guideline is “tested” in daily practice for several months. The professionals maintain records of the 0–19 year-olds and of obstacles they encounter when working with the draft guideline. To provide management information, the professionals maintain records of time, materials and other resources needed to work with the guideline. Focus interviews are conducted later with professionals and managers using the recording forms and a list of generic determinants (M. Fleuren et al., 2004; M. A. Fleuren et al., 2014). The final guideline is adapted in accord with the results of the determinant analysis. Core elements/activities within the guideline will not deviate because they are evidence-based. However, changes will be made to the formatting, wording and related factors in accord with the professionals' needs.
2. *Innovation strategies adapted to the outcomes of the determinant analysis*. Training related to the content of the guidelines was

developed and offered to all individual professionals for the older guidelines. Since 2012, instructions about the content of the guideline are released to the implementation coordinators, who are expected to disseminate this knowledge within their own organization (in accord with the "train-the-trainer" principle). E-learning modules and implementation toolkits related to the outcomes of the determinant analyses have also been developed for this purpose. The toolkits include, for example, PowerPoint presentations, documents with frequently asked questions and often, client brochures. The NCJ coordinates all these implementation activities at the national level.

3. *Dissemination of the guideline*. With the exception of the guideline on scoliosis, which was not published, all of the guidelines were disseminated. Hard copies of the first nine guidelines were sent to all individual professionals and/or organizations. Since 2010, no hard copies have been available, except for the flowcharts describing the core elements/activities in the guideline. The guidelines are sent as PDFs to the organizations and are published on the NCJ's website, where professionals may download them themselves. The number of unique visitors and the duration of their visits are recorded.
4. *Evaluation and performance feedback*. At the request of the Ministry, the first three guidelines were evaluated to determine the use of the core elements/activities and the determinants of use. A lack of financing was the foremost reason for the discontinuation of this systematic evaluation. In 2012, the NCJ requesteda quick scan of the use of all guidelines published before 2012. A systematic evaluation of both the use and the determinants of use of all guidelines has been planned within the next five years.
5. *Implementation coordinators and infrastructure*. Implementation coordinators were recruited in all organizations for the introduction of the first guidelines. The coordinators received special training covering implementation principles, training skills and the drafting of an implementation plan adapted to local circumstances. Follow-up meetings were organized for exchanges of experiences between organizations and with the developers of the guidelines. A shortage of financing was the foremost reason for the discontinuation of this network of implementation coordinators. When the NCJ was established, coordinator recruitment recovered, and an infrastructure emerged bringing together the organizations and the NCJ at the national level.
6. *A national help desk*. In the early years, individual guideline developers were available to answer questions. Since the NCJ (or more precisely its predecessor) was established in 2006, there has been a help desk at the NCJ.

During the history of PCHC guidelines, there have been, broadly speaking, four financial phases:

- From 1996 to 2004, funding was available for the development and evaluation of the use of the guidelines. There was no budget for implementation activities and only a small budget for the training of implementation coordinators and the establishment of an infrastructure of implementation coordinators.
- From 2005 to 2008, only the development of the guidelines was funded.
- From 2009 to 2012, funding was available for the development of the guidelines. Limited funds were earmarked for implementation activities and the establishment of an infrastructure of implementation coordinators. There was no budget for evaluation activities.
- Between 2012 and the present, funding has been available for development, implementation, evaluation and the maintenance of an infrastructure.

As shown in Table 1, the uptake of the various activities in the national implementation plan was closely related to the allocation of available financial resources (M. A. H. Fleuren and Jong de, 2006; M. A. H. Fleuren, 2010; Jong de et al., 2002).

3.2. Evaluation of use

3.2.1. Outcomes in terms of use

The response rates for the studies on hearing disorders, visual disorders and congenital heart disorders were 54%, 64% and 65%, respectively. The response rate for the study covering all guidelines published before 2012 was 63%. Overall, there were no systematic differences in the response rates between organizations and between disciplines.

Table 2 shows summarizes the overall percentages of PCHC professionals who know the guidelines exist (awareness), the use of individual core elements/activities and the mean level of use of all core elements/activities among PCHC professionals (M. A. H. Fleuren et al., 2004; M. A. H. Fleuren et al., 2007; Lanting et al., 2013). The 2012 study shows that only the guideline on visual disorders meets the criteria of both 90% awareness and 80% use (Table 2). The guidelines on congenital heart disorders, on short stature and on family counseling if a child dies are fairly well used. As expected, there is considerable variation in the use of individual core elements/activities within the guidelines. For example, two core elements/activities only, which were related to the use of a dummy/pacifier, accounted for low levels of the full use of the guideline on sudden infant death. These elements were adhered to by 28% and 32% of the respondents. In contrast, the advice regarding placing babies on their back to sleep or non-smoking in the same room as the baby were adhered to by 98% and 96% of the professionals, respectively.

There were differences in the awareness of the guidelines between the disciplines, but not between the organizations. In general, the awareness percentages were higher for the doctors than for the nurses and doctors' assistants. Overall, there were no *systematic* differences between organizations and between disciplines in response concerning the use of the core elements.

3.2.2. Differences in awareness and use over time

Awareness of the guideline on hearing disorders increased significantly over time. Awareness of the guideline on visual disorders did not vary significantly over time, whereas awareness of the guideline on congenital heart disorders fell significantly (Table 2). The percentage of professionals who had applied all core elements for all (or nearly all) children increased significantly over time for the guideline on visual disorders, from 30% in 2005 to 86% in 2012 (Chi-square $= 153.6$, df $= 1$, $p < 0.001$). Additionally, the application of all core elements in the guideline on congenital heart disorders increased significantly over time, from 56% in 2006 to 73% in 2012 (Chi-square $= 13.1$, df $= 1$, $p < 0.001$).

3.2.3. Outcomes in terms of determinants

The pooled analysis of the five PCHC studies showed that nine determinants were significant in the multivariate regression model. The following determinants best explained the adherence: self-efficacy, formal ratification by management, personal benefits/drawbacks, awareness of content guideline/program, client/patient satisfaction, descriptive norm, time available, feedback to professional about the innovation process and the guideline/program complexity.

4. Discussion

The failure to implement guidelines is a common pitfall. Although

Table 2
Awareness of the guideline and its use among PCHC professionals, in percentages.[a]

	Year(s) of evaluation	Awareness	Range of use of individual core elements (number of core elements evaluated)[b]	Mean level of use all core elements	Number of respondents
Hearing disorders	2001	67			376
Hearing disorders	2012	82[c]	65–91 (5)	70	137
Visual disorders	2005	90	38–94 (17)	65	417
Visual disorders (update)	2012	93[d]	88–97 (5)	92[f]	261
Scoliosis	2012	54	50–86 (5)	69	82
Congenital heart disorders	2006	97	17–100 (36)	79	221
Congenital heart disorders	2012	86[e]	72–95 (8)	81[g]	235
Psychosocial problems	2012	50	53–72 (3)	62	272
Sudden infant death	2012	95	28–98 (6)	67	168
Family counseling if a child dies	2012	79	67–100 (5)	84	223
Prevention of child abuse	2012	86	67–82 (5)	74	264
Short stature	2012	81	74–85 (4)	80	259

[a] The aim is that ≥90% of the professionals should be aware of the guideline and that ≥80% should perform each core elements/activity for all (or nearly all) children.
[b] Only respondents who were aware of the guideline and who were responsible for performing the core elements; numbers are lower than in the last column.
[c] Significant difference over time between 2001 and 2012 (Chi-square = 10.6, df = 1, $p < 0.001$).
[d] No significant difference over time between 2005 and 2012(Chi-square = 2.01, df = 1, $p < 0.001$).
[e] Significant difference over time between 2006 and 2012 (Chi-square = 16.7, df = 1, $p < 0.001$)).
[f] Differences between 2005 and 2012 not compared since there was a large difference in the number of core elements between the studies.
[g] Differences between 2006 and 2012 not compared since there was a large difference in the number of core elements between the studies.

many studies have shown that the level of implementation affects guideline outcomes, both systematic implementation activities and evaluation remain undervalued in many guideline processes. We attempted to introduce the Preventive Child Health Care guidelines in the Netherlands systematically by connecting development, implementation and monitoring of the actual use of the guidelines. All stakeholders in PCHC working in the fields of policy, research and practice were therefore involved from the outset. This enabled the exchange of experiences and specific expertise, resulting in a national implementation plan that was adopted by all stakeholders. A major role was also played by the former Minister of Health, Welfare and Sport who requested, in addition to development, research into how the guidelines could best be introduced. Now, fifteen years later, we may conclude that most of the goals in the national implementation plan have been achieved, except for the systematic evaluation of the use, and the determinants of use, of the guidelines.

A second conclusion is that although a comprehensive national implementation plan was available, the rapid rolloutof this plan was not easy. A lack of financial resources was both a considerable obstacle and a facilitating factor. More specifically, prioritizing the available financial resources was the most important determinant. As the results showed, the uptake of several activities in the national implementation plan was closely related to the available financial resources and the associated decisions. In the beginning, ear-marking financing for implementation and monitoring activities was certainly not a self-evident decision for some stakeholders. They believed that the professionals themselves were fully responsible for implementation.

It was only when the PCHC professionals were presented with large numbers of guidelines that they were unable to adequately put into practice that calls for implementation activities were heightened. As in other countries, there is a tendency to continue to produce guidelines, along with a general underestimation of the challenges associated with implementation and evaluation (Kryworuchko et al., 2009).

Although many of the planned activities have been put into practice, the current design is limited in some respects and there is room for improvement, particularly with regard to evaluation. We still have five issues that warrant continued consideration. The first is a systematic evaluation of the determinants of use, and the continuation of the use, of the core elements/activities in all guidelines. This is needed for fine-tuning and/or redesigning the innovation strategy, both in the immediate future and over the course of time. Second, the effect of the innovation strategies should be evaluated. Although the innovation strategies in place have been tailored with respect to the outcomes of the determinant analysis, and even though they meet the needs of the implementation coordinators and PCHC managers, we cannot state with confidence that exposure to the various strategies has had the intended effect on the use of the guidelines. Third, the evaluation of adherence and the determinants of adherence at the level of the end users (0–19 year-olds and their parents) are also necessary to explain whether the effects of the guideline have been achieved. Fourth, in addition to measuring the completeness of use (*whether* the professional completes a core element/activity), we want to explore the quality of use (*how* the professional completes a core element/activity). Completeness is a widely applied measure in implementation research (Dusenbury et al., 2003). In the case of some guidelines, the quality of delivery may be an important factor in terms of understanding why the effects of a guideline materialize or fail to do so (Dusenbury et al., 2003). For example, in the PCHC guideline for the prevention of child abuse, a core element requires the professional to provide the client with relevant information. In this case, the question is not just *whether* the professional has completed the activity but also *how*. In this example, the interaction between the professional and the client is important and this factor is not fully assessed by merely measuring “completeness”. The fifth and final item on our list is the observation that the use of questionnaires and self-reported adherence measures, as applied in current studies, is a limitation that may result in an overestimate of actual use compared to other methods (Adams et al., 1999). Although factor analyses for constructing scales and reliability analyses were applied, the questionnaires were not validated against other measures. Furthermore, measuring the quality of use also implies other measurement methods. Questionnaires, registration forms, digital files and the like are generally suitable for measuring quantitative aspects of use: has a core element been implemented, for example? Observations and interviews are often more suitable for measuring the qualitative aspects of use.

Despite the limitations listed above relating to systematic monitoring, more insight in the use of the guidelines has been achieved. As a result of the studies that have been performed, we now know which guidelines require attention because of suboptimal use. The studies have also contributed to an enhanced understanding of the determinants that should be measured to predict the use of individual core elements/activities in the PCHC

guidelines. A systematic evaluation of both the use, and the determinants of the use, of all guidelines has been planned by the NCJ to be conducted within the next five years.

Although this article describes the systematic introduction of PCHC guidelines in the Netherlands, the procedure and results could be of interest to guideline developers, implementation consultants, implementation researchers, health care professionals and policy-makers in other countries. As was shown recently, ongoing implementation and monitoring activities also remain a challenge in other countries (Kryworuchko et al., 2009). We would like to encourage a shift in thinking about guideline processes and propose methodical consideration of postponing the development of guidelines in favor of implementation activities and research. Ultimately, it appears that little value is generated in producing guidelines that are not properly implemented or being used.

Competing interests

The author(s) declare that they have no competing interests.

Authors' contributions

MAHF was responsible for the innovation framework, drafting of the national implementation plan, the design of the various evaluation studies, the measurement instruments, supervision of the analyses and drafting the manuscript. PVD conducted the analysis. TD developed an infrastructure based on the national implementation plan to provide for systematic implementation and to support the PCHC organizations through various implementation strategies. All authors commented on, and approved the final manuscript.

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