Taxonomic systems in the field of health care, family care, and child and youth care: A systematic overview of the literature

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ABSTRACT

Taxonomies of child, youth, and family care are needed for the adequate comparison of the effectiveness and usefulness of care and treatment programs. Until now, no systematic overview has been made of the taxonomies available and their outcomes. The aim of this paper is to systematically summarize the evidence available about taxonomies for child, youth, and family care. We searched the literature published during the period 1990–2011 in the databases Medline, PsycInfo, SocIndex, and Eric, using various terms related to the content of care. We identified 894 publications, out of which 13 met the inclusion criteria. The taxonomies identified always included the following aspects: the recipients of care and treatment, the intervention content, the intensity and complexity of the care arrangements, and the environment in which the intervention took place. Most of the taxonomies showed a structure with domains and sub-axes which were intended to enhance feasibility in practical applications. However, the empirical data concerning their use in daily practice were scarce. We concluded that several rather similar taxonomies were available but that the feasibility of such systems in daily care required more attention.

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1. Introduction

Care for children with behavioral and emotional problems, and their families, varies greatly between providers of child, youth, and family care. At the very least this variation involves the labels that are used to denote this care, and may also involve the actual contents (Fein, 2002). This lack of clarity has several disadvantages. First, it makes the field of child, youth, and family care complex and incomprehensible for clients and financers. Second, it limits the possibility of obtaining and comparing research on the outcomes of interventions and on the relative merits of various treatment strategies and techniques being used. We only have a vague idea of what care has been offered to children and their families, which limits our ability to compare and evaluate interventions and outcomes across care providers (Ezell et al., 2011). In line with this picture, care is often described as a "black box" (Fein, 2002; Libby, Saranga Coen, Price, Silverman, & Orton, 2005; Sinclair, 2010), meaning that it is not clear what care for youth and families precisely entails.

A way out of this situation is to develop a device for monitoring and recording the care that is being offered in practice, that is, to develop a *care taxonomy*, a classification system that will enable us to categorize the contents of care in a valid and reliable way (De Jong,

1995; Salamon & Anheier, 1992). Taxonomies regarding health problems are well-known, for example, the International Classification of Diseases (ICD: World Health Organization, 1993), the International Classification of Functioning (ICF: World Health Organization, 2002), and the Diagnostic and Statistical Manual of Mental Disorders (DSM: American Psychiatric Association, 1994). These taxonomies are capable of classifying diseases, health conditions, and dimensions of disabilities.

Only a few taxonomies for classifying care and treatment have been developed, whereas the need for them is great. De Jong (1995) mentions several functions that such a taxonomy should have. First, the taxonomy should make it possible to standardize descriptions of interventions that are being used within a particular domain. This would promote communication between care providers and, as mentioned before, it could clarify the similarities and differences between interventions. Second, it should support a link between the costs and the care offered, which is needed for cost-containment in care. Third, it should support the evaluation of the care that is offered in terms of its outcomes and effectiveness (De Jong, 1995; Schulz, Czaja, McKay, Ory, & Belle, 2010). Fourth, a taxonomy should help to control the quality of the care that is being offered (De Jong, 1995; Schulz et al., 2010).

Taxonomies of care have obvious advantages (De Jong, 1995; Kovess, 1997; Schulz et al., 2010), but an overview of the contents and applicability of the systems available in the field of child, youth, and family care is lacking. The aim of this paper is to systematically summarize the available knowledge on the taxonomies of child,

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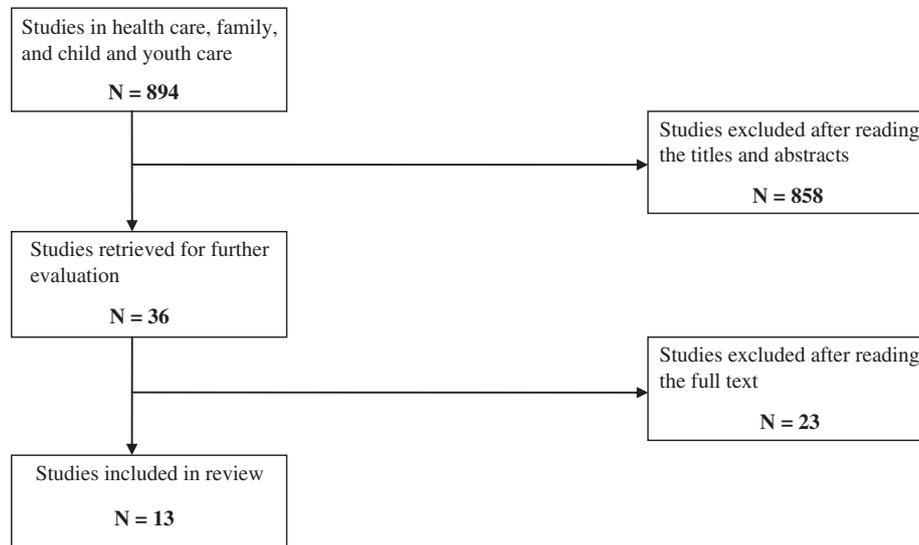 *E-mail address:* k.e.evenboer@rug.nl (K.E. Evenboer).

Fig. 1. Flow diagram: selection of studies.

youth, and family care, with a focus on their contents, psychometric qualities, and applicability in daily practice.

2. Method

We searched the literature published in English, German, Dutch, and French during the period January 1990–(May) 2011 in the databases Medline, PsycInfo, SocIndex and Eric. The keywords, separate and in combination, used were:

- *Taxonom** [1] *and family care* (N[2] $= 151$)
- *Intervention**, *nursing, classification** *and classification system** ($N = 356$)
- *Taxonom**, *family care and intervention** ($N = 28$)
- *Taxonom**, *intervention** *and health care* ($N = 156$)
- *Taxonom**, *intervention** *and techniques* ($N = 60$)
- *Youth**, *mental health and service pathway** ($N = 132$)

This search yielded 883 potentially relevant studies (135 duplicates were excluded from the review). In addition, we searched references and we used the search machine Google Scholar to identify additional books and articles published between 1990 and 2011 related to the topic ($N = 11$).

In total, 894 publications were identified for further assessment. Next, we applied two inclusion criteria for further selection, based on reading titles and abstracts: (1) the study was an empirical study; and (2) the study reported on a taxonomy or classification system of care or on interventions which were situated in the field of health care, family care, or child and youth care. This resulted in 36 remaining manuscripts. After reading their full text, 23 studies were excluded because they were not applied in practice. This resulted in 13 studies which met all the inclusion criteria; they form the material for further assessment (see Fig. 1 for the selection procedure).

From these 13 studies we extracted information on the aim of the study, the results of using the taxonomy clinically or conceptually, the unit of analysis, the domains and the sub-axes level of classification, and the results and psychometric qualities. *Clinically applied* means that the taxonomy was applied to people (patients, clients, and/or professionals) in daily practice. *Conceptually applied* means that the

taxonomy was applied to intervention descriptions. The level of classification was micro, meso, or macro. Recording information at *micro-level* means that information on the use of specific intervention techniques and activities applied to individuals could be gathered. Examples at this level are 'giving emotional support' and 'structuring daily routines'. *Meso-level* means that gathering of information was directed at the use of care, treatment methods, and modules, for example, for management purposes. Examples at this level are treatment methods such as 'social skills training' and 'family therapy'. *Macro-level* classifications gathered information on the level of care and treatment programs: arrangements or "packages" of care for groups of patients or clients, e.g. for policymakers. Examples at this level are 'community based prevention programs' and 'residential child care programs'.

3. Results

The taxonomies included in this review can be divided into three different fields of care, namely, health care ($N = 8$), family care ($N = 3$), and child and youth care ($N = 2$). In Table 1 each of the taxonomies included are briefly discussed in terms of the aforementioned information, thereby focusing on their most salient characteristics and their usefulness.

3.1. Taxonomic systems in health care

For health care, Abraham and Michie (2008) developed a taxonomy for coding treatment techniques in terms of behavioral change (i.e., more physical activities and healthy eating) based on descriptions from intervention manuals. This taxonomy is capable of classifying treatment techniques in very detailed categories such as "prompting self-monitoring of behavior," "prompting specific goal setting," "providing information on consequences," and "providing feedback on performance."

More recently, Michie, Hyder, Walia, and West (2011) developed a taxonomy of behavior-change techniques that were used within an individual behavioral support program for smoking cessation. Twelve of the 43 techniques were the same as those used in the aforementioned taxonomy (Abraham & Michie, 2008). By using the second device, Michie et al. (2011) showed that this reliable taxonomy can provide a starting point for investigating the association between the intervention content and the outcomes of the smoking-cessation program.

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[1] The asterix (*) means that the search term is used singularly and in combination with other terms.

[2] Number of studies that were found using specific (combinations of) search term(s).

Table 1
An overview of studies on care taxonomies in the field of health care, family care, and child and youth care (January 1990–May 2011).

Field of care Health care	Country	Aim of the study	Clinically or conceptually applied	Units of analysis Persons intervention descriptions	Domains and sub-axes	Level of classification	Results	Psychometric qualities
1. Abraham & Michie, 2008	England	To test a theory-linked taxonomy of generally applicable behavior change techniques (BCTs).	Conceptually	N=26	26 sub-axes	Micro	The findings show the feasibility of developing standardized definitions of BCTs in reporting the intervention content as described in manuals.	Kappa 0.79
2. Belle et al., 2003	USA	To develop a taxonomy which can classify treatment components used in psychosocial and behavioral interventions.	Clinically	N=1222	12 domains	Meso/Macro	Individual treatment elements can be described in terms of their effectiveness. The method allows information to be combined across different interventions by deconstructing them so as to describe them according to a set of common measurements.	–
3. Cohen et al., 1991	USA	To develop a taxonomy of ambulatory care nursing activities that records the contents of care.	Clinically	N=10	2 domains 7 sub-axes	Meso	The categories used in the taxonomy are capable of classifying all interventions. Not all subcategories where used.	–
4. DeJong et al., 2004	USA	To develop a recording instrument and taxonomy of interventions in rehabilitation care which can provide insight into the effectiveness of an intervention.	Clinically	N=1400	11 domains 63 sub-axes	Micro	Statement about the effectiveness of interventions can be made if patient and treatment characteristics, environmental factors, and outcomes are combined.	–
5. Krumholz et al., 2006	USA	To develop a taxonomy which is able to categorize and compare disease management programs and identify specific factors associated with effectiveness.	Conceptually	N=2	8 domains 34 sub-axes	Meso	It facilitates a better comparison of the structure, process, and outcomes across disease management programs.	–
6. Michie et al., 2011	England	To develop a reliable taxonomy of behavior change techniques (BCTs) used within individual behavioral support programs for smoking cessation.	Conceptually	N=43	43 sub-axes	Micro	A reliable taxonomy which is capable of classifying BCT's and which investigates the association between intervention content and outcomes.	Kappa 0.84
7. Schulz et al., 2010	USA	To expand an existing taxonomy for characterizing interventions by identifying elements that might be	Conceptually	N=24	11 domains 73 sub-axes	Micro	Applying the taxonomy in real life will enhance the opportunities for improving intervention designs, the	–

		related to outcomes and which are crucial for replication and extension of intervention science.					replication and follow-up of intervention studies, information about the efficacy and effectiveness of intervention components, and information about implementing interventions in a broader community.	
8. Thoroddsen, 2005	Iceland	To test the applicability of the Nursing Interventions Classification (NIC) for use in a future nursing information system for documenting nursing care in Iceland.	Clinically	$N = 198$		6 domains 27 sub-axes	Micro	The language used in the NIC is a powerful tool for reflecting nursing practice and preparing nurses to use a standardized language.	–
Family Care								
9. Metselaar, 2011	Netherlands	To develop a taxonomy and recording system which is able to record the actions of family workers.	Clinically	$N = 94$		5 domains 44 sub-axes	Micro	The taxonomy and recording instrument can provide an insight into the actual worker activities and the techniques that were used in daily practice.	–
10. Conradie et al., 2011; Tausendfreund et al., 2010	Netherlands	To develop a taxonomy and recording instrument to create detailed knowledge about activities and techniques that were conducted in the care process.	Clinically	$N = 76$		5 domains 55 sub-axes	Micro	The taxonomy and recording instrument provides insight into the actual activities and the techniques conducted by care workers in the care process for multi-problem families.	–
11. Ten Brink et al., 2004	Netherlands	To see if the intervention Families First was implemented as intended by using a taxonomy and recording instrument.	Clinically	$N = 234$		7 domains 37 sub-axes	Micro	The taxonomy and recording instrument provides better communication between family workers about which activities and techniques should be used and which ones actually were used during the treatment.	–
Child and Youth Care								
12. Van Yperen et al., 1999	Netherlands	To develop a taxonomy related to the field of youth care which must be able to record the contents and types of care.	Clinically	$N = 500$		6 domains	Meso	The lack of standardization means that the same activity is described under different names. The system is capable of answering topical policy-related questions.	–
13. Van Yperen et al., 2005	Netherlands	To develop a taxonomic system for classifying preventive, curative, and repressive interventions used in The Netherlands.	Conceptually		$N = 36$	5 domains 10 sub-axes	Meso	The system provides useful information, but there are marginal notes concerning the goal of classification, the quality and usefulness of the sub-axes, and the terms and definitions that were used.	–

The taxonomy of Belle et al. (2003) describes general methods and approaches to decrease distress among family caregivers of persons with dementia as found in the Resources for Enhancing Alzheimer's Caregiver Health (REACH) program. The taxonomy is much less detailed than the taxonomies of Abraham and Michie (2008), Michie et al. (2011). It classifies individually applied interventions and establishes the groundwork for examining the relationship to outcomes. Results indicate that actively targeting the caregiver behavior of the family member is effective in achieving positive outcomes in dementia patients.

Thoroddsen (2005) classified nursing techniques on a very detailed level by using the Nursing Interventions Classification (NIC). Results show that the NIC is applicable for describing the work and activities of nurses in daily practice. The NIC taxonomy has created a standardized language that can be used in the future to register nursing activities in electronic patient records (Thoroddsen, 2005). Stocker-Schneider and Haynes Slowik (2009) used the same NIC taxonomy to classify interventions among patients with coronary artery disease. The results show that the system can be used to plan, evaluate, and determine the effectiveness of interventions used in nursing care.

Cohen, Arnold, Brown, and Brooten (1991) developed a taxonomy to describe ambulatory nursing care interventions. The taxonomy was applied to hospital visits. Some of its classification categories are, for instance, health care maintenance, patient education, and therapeutic care. Research done with the taxonomy indicates that the categories captured all the interventions during the hospital visits studied, but not all sub-categories were used in describing the transitional follow-up care interventions.

DeJong, Horn, Gassaway, Slavin, and Dijkers (2004) developed a recording instrument and a taxonomy in the field of rehabilitation care. The taxonomy classifies which intervention has been provided to the patient, the duration of the activities, and the persons involved in the treatment. The results of using the taxonomy clinically indicate that the taxonomy is used and interpreted similarly across different treatment settings and by different users. At the same time the authors stressed that an intervention taxonomy in rehabilitation care is in its infancy.

The American Heart Association Disease Management Taxonomy Writing Group (AHA Writing Group) developed a taxonomy to classify disease management programs into domains like intervention recipient, intervention content, intensity and complexity of the intervention, environment, and outcome measurements (Krumholz et al., 2006). The AHA Writing Group validated the model over a number of disease management programs. This taxonomy is capable of describing program attributes at a meso-level and allows for comparisons across different intervention approaches.

Schulz et al. (2010) developed an "Intervention Taxonomy" (ITAX) which was tested by investigators not involved in the taxonomy's development. They applied the taxonomy to their own studies. The taxonomy was capable of classifying different domains such as the method of communication between the participant and the interventionist, the location of service delivery, the duration and intensity of the intervention, interventionist characteristics, and treatment implementation.

3.2. Taxonomic systems in family care

Ten Brink, Veerman, De Kemp, and Berger (2004) developed a micro-level taxonomy of care and treatment involving multi-problem families. The taxonomy consists of seven domains, each containing different treatment techniques. By using a recording instrument derived from the taxonomy, caretakers were able to record what actually happened during the treatment on a very detailed level. Results showed that it became clear whether the intervention was implemented as intended; the tool enabled a description of the activities that were applied during the treatment (Ten Brink et al., 2004).

The "Activities List" (AL) by Metselaar (2011) is based on the taxonomy of Ten Brink et al. (2004). Data were gathered by using a self-report form. The AL enabled family care workers to record their activities and the techniques used during the treatment process in families with behaviorally disturbed children. Results of applying the recording instrument and taxonomic system in practice mirrored the daily activities of family care workers. The feedback from the monitoring tool was very much appreciated by care workers as input for in-service training sessions (Metselaar, 2011).

Tausendfreund, Conradie, Knot-Dickscheit, and Knorth (2010); Conradie et al., 2011 developed a taxonomy and recording instrument based on the taxonomy of Ten Brink et al. (2004) and the AL of Metselaar (2011). It was slightly adapted for application in a treatment program called "10 For Future" (10FF) for multi-problem families in The Netherlands. The same five domains as found in the AL were used. The results showed that the activities in the list covered the work of caretakers in 10FF very well (Tausendfreund et al., 2010). A pilot program demonstrated that few of the activities were directed towards the children at risk; instead, the majority of them were directed towards the parents.

By using these kinds of taxonomies and recording instruments, detailed information about the care process within family care can be gathered (Metselaar, 2011; Tausendfreund et al., 2010; Ten Brink et al., 2004). Table 2 shows some of the similarities and differences of these family care taxonomies. It also covers information on two taxonomies in the child and youth care field.

3.3. Taxonomic systems in child and youth care

Van Yperen, Konijn, and Ten Berge (1999) developed a taxonomy for describing care and treatment interventions within the field of child and youth care facilities. It consisted of six domains (Table 2). The taxonomy was tested on files of children within the Dutch child and youth care system, but not prospectively in routine care. The system was found to be capable of collecting information on an individual case level. Preliminary results showed that at that time (1) the taxonomy was not able to adequately classify specific goals of care, (2) the use of its paper version was laborious, and (3) the terminology did not adequately suit the terminology used in daily practice. Aspects such as type of care and location, duration, intensity of care, and the expertise of the caregiver were assessed as relevant.

Some years later, Van Yperen, Loeffen, Van den Berg, and Lekkerkerker (2005) developed another taxonomy for classifying preventive and curative interventions and custody care in The Netherlands. This classification of interventions was based on a number of themes, using domains and sub-axes. Each sub-axis represents an essential characteristic of an intervention. An expert meeting showed the need for such an intervention taxonomy. There was less agreement on the relevance and the quality of the sub-axes and the terminology used within this study. It was found that the domains, sub-axes, and categories needed to be elaborated further before using the system in practice.

4. Discussion

In our systematic summary of the knowledge available about the taxonomies of health care, family care, and child and youth care, we found thirteen taxonomies which varied widely in terms of important characteristics such as contents and level of aggregation. A majority had been developed in health care and stemmed from the USA, The Netherlands, the UK, and Iceland. Eight of the thirteen taxonomies discussed had been clinically applied in practice; patients, clients and/or their professional caretakers, i.e. the care they received, are the unit of analysis. The remaining five taxonomies were conceptually applied to intervention descriptions. Only Abraham and Michie (2008)

Table 2
Domains of the taxonomies in family care and child and youth care.

Study	Domains (example of sub-axe)
Metselaar (2011)	Family care 5 domains: 1. Maintaining a relationship (emotional support) 2. Gathering and processing information (observation) 3. Encouraging behavioral change (feedback on anti-social behaviors) 4. Finding solutions in the social network (social support) 5. Making the family's daily tasks lighter (practical care at home)
Conradie et al., 2011; Tausendfreund et al., 2010	5 domains: 1. Maintaining a relationship (increasing motivation) 2. Gathering and processing information (network analysis) 3. Encouraging behavioral change (instructions and advice for behavior change) 4. Finding solutions in the social network (building a social network) 5. Making the family's daily tasks lighter (help with administration and financial management)
Ten Brink et al. (2004)	7 domains: 1. Basic techniques (giving positive feedback) 2. Gathering information and setting goals (using goal cards) 3. Teaching social skills (providing a role model) 4. Teaching cognitive skills (structuring daily routines) 5. Teaching handling of emotions (techniques for recognizing and handling emotions) 6. Practical help (household) 7. Material help (technical/maintenance)
Van Yperen et al. (1999)	Child and youth care 6 domains: 1. Activities (social skills training) 2. Goals (help in crisis situations) 3. Expertise of caregivers (psychotherapist) 4. Type of care and location (residential care) 5. Duration (e.g., longer than 4 years) 6. Intensity (e.g., 3–5 days a week)
Van Yperen et al. (2005)	5 domains: 1. Characteristics of the target group (age child/adolescent) 2. Characteristics concerning the contents of care (content characteristics) 3. Form characteristics (recipients of care and treatment) 4. Characteristics of quality (degree of effectiveness) 5. System characteristics (functions)

and Michie et al. (2011) reported information on psychometric qualities of the taxonomic systems that were used within their studies.

The variability in approaches provides a good and probably rather conclusive overview of potentially relevant characteristics of the ideal taxonomy that may help to open the black box. Such an ideal taxonomy should at least cover: the intervention content(s), the intervention recipient(s), the professional skills needed to provide the intervention, the duration of an intervention, the intensity of and intervention, the setting needed to provide the intervention. In order to be able to identify what the care consists of, it is probably most efficient to use a taxonomy at micro-level. This kind of taxonomy makes it possible for care and treatment techniques and approaches to be classified in a detailed manner, and findings can be aggregated to the meso-level and macro-level if needed. However, such detailed systems are also often very hard to use in practice (Van Yperen et al., 1999). A more general means of assessment on a meso-level might offer a good trade-off vis-à-vis these advantages and disadvantages.

One of the most sophisticated taxonomies we discovered in this review was the Nursing Interventions Classification, NIC (Stocker-Schneider & Haynes Slowik, 2009; Thoroddsen, 2005). One important advantage of this taxonomy was that it created a common language within the nursing discipline. This made it easier to do research and communicate on the quality of nursing, and to compare the interventions being used in health care.

All the taxonomies in the domain of family care that we found have been developed in The Netherlands, and classify care and

treatment at a micro-level by using a recording instrument. In this way, detailed information on the care process becomes available. The taxonomies were all clinically applied within the studies mentioned, with families as the unit of analysis. What is striking about these taxonomies is that they are conceptually and instrumentally strongly connected, yet each represents treatment techniques that are adapted to the specific situation in which the taxonomy is being used. None of these studies in family care reported on the psychometric qualities of the taxonomies, despite the fact they had all been clinically applied in practice.

As to the child and youth care field, both of the taxonomies identified for this field had also been developed in The Netherlands and both classified their information on a meso-level. The first classification of Van Yperen et al. (1999) was clinically applied in practice, with children as the unit of analysis. In particular, the sub-axes of this taxonomic system (see Table 2) were examples of those components which would have to be recorded in order to make specific statements on the contents and effectiveness of the care offered to the children and their families. An evaluation, however, showed that this taxonomy is was still too broad and rough for caretakers to use in daily practice. We did assess the contents of this system as useful for developing a taxonomy of care in the future.

By gathering information on these components, the main parts of the intervention's "black box" can be opened, and information about service pathways or trajectories of children and their families can be gathered in a more detailed way than has been done up until now (Maschi, Hatcher, Schwalbe, & Rosato, 2009). Defining and describing interventions with the help of the aforementioned components creates a basic condition for research into the pivotal question of how and why care works (or does not work).

For any taxonomy, whether currently in use or brand new, it is highly important to adapt the terminology to match the particular terminology used within a health care or welfare organization in order to be able to gather data with the that taxonomy. In addition, the taxonomy should be as short as possible, as well as understandable and unambiguous. This way, care workers will be able to use the taxonomy to classify the techniques and approaches that they used during the treatment. This makes the taxonomy more manageable and increases the chance of the system being used in practice so that information about the care pathways of children and their families can be collected.

Up until now, little information on the psychometric qualities of the taxonomic systems has been available. If a taxonomy of care is developed in the future, it should be tested for psychometric qualities. The taxonomy should be clinically applied in practice, with children and young people as the unit of analysis. Reliability should be determined on the basis of inter-rater reliability and internal consistency. Its validity should be tested by organizing expert meetings in which caretakers have the opportunity to work with the taxonomic system, applying it to fictitious cases. The feedback from the care workers should be used to improve the taxonomy and make it more manageable in their organization.

One major strength of our study is the very thorough search strategy that covered all the relevant literature databases and included a check of the references of the papers that were found. Despite this, we may still have missed some publications (e.g., studies that were poorly indexed in the databases). Another strength is that we covered a wide array of relevant care settings. One limitation may be that we limited the languages to English, German, Dutch, and French. Our subsequent snowball sampling may partially have solved this potential limitation, but its results may be somewhat limited to publications in English and Dutch.

In conclusion, several taxonomies in the field of health care, family care, and child and youth care have been developed. None of these systems is as yet fully capable of measuring the characteristics of care and the treatment of children and families with behavioral and

emotional problems in the most desirable way. This would entail gathering information about the intervention content, the intervention recipient, the expertise of the caregiver, the duration of an intervention, the intensity of an intervention, and the environment in which the intervention took place in as detailed a manner as possible. Knowledge about the effectiveness of care and treatment arrangements – so urgently needed – presupposes information of high quality about the contents of care.

We strongly recommend that information about the use of services and about the service pathways of children and their families should be gathered in a valid and reliable way. A taxonomy of care, capable of recording the most salient components of the care process, is a prerequisite for doing so. Development and testing of such a device will help to empirically connect the process and outcome characteristics of child and family care, and treatment, and to learn about "what works."

Acknowledgments

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