Supporting Adherence to the Guideline of Secondary Prevention of Child Abuse

The Development of a Digital Tool for Child Health Care Professionals

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English Summary

Child abuse is a serious and unnecessary problem. To prevent child abuse, a guideline has been developed for Child Health Professionals: the Guideline for Secondary Prevention of Child Abuse. This guideline supports professionals in the decision making process when child abuse is suspected. It is an extensive document to which adherence by professionals is not yet optimal. This paper tried to design an innovation to support professionals in following the guideline.

For this purpose two series of interviews took place. In the first series of interviews, end-users were asked about what problems they currently experienced in using the guideline; current work routines; and needs and barriers for an innovation. The results of these interviews was combined with insights gained from literature (on guideline adherence, persuasive technologies and implementation and adoption theories) to design initial prototypes.

It turned out that users made little use of child abuse experts, who are meant to be a key component of the guideline. Moreover, the decision making process took longer than intended by the guideline. The decision was made to support every step of the process with the innovation. A primary need identified by participants was that the innovation should be clear. A major identified barrier was a lack of time to use the innovation.

These prototypes were tested in a second series of interviews, using the same group of end-users. Prototypes were generally received well and deemed to be very clear. Few alterations were deemed to be necessary by participants. Surprisingly participants had asked for a component of the guideline to be embedded in the innovation (the roadmap of the decision making process) – but this component was received poorly, and was deemed to be unclear and unsupportive.

Since then the tool has been developed further by software developers.

Nederlandse Samenvatting

Kindermishandeling is een serieus en onnodig probleem. Om kindermishandeling te voorkomen is een richtlijn gemaakt voor Jeugd Gezondheidszorg verpleegkundigen en artsen: de JGZ-Richtlijn Secundaire Preventie Kindermishandeling. Deze richtlijn ondersteunt professionals in het beslissingsproces wanneer er sprake is van een vermoeden van kindermishandeling. Het is een uitgebreid document dat nog niet optimaal wordt opgevolgd. Dit onderzoek gaat over het ontwerpen van een applicatie om professionals te ondersteunen in het opvolgen van de richtlijn.

Hiervoor zijn twee series interviews gehouden. In de eerste serie interviews werden eindgebruikers gevraagd naar welke problemen ze momenteel ervoeren bij het gebruiken van de richtlijn; huidige werk routines; en eisen en barrières voor een innovatie. De resultaten van deze interviews werden gecombineerd met inzichten verkregen vanuit literature (over het opvolgen van richtlijnen; persuasieve technologie; en implementatie theorieën) om een eerste serie prototypes te ontwerpen.

Het bleek dat gebruikers weinig gebruik maakten van aandachtsfunctionarissen. Dit zijn experts op het gebied van kindermishandeling en kunnen collega's ondersteunen in het beslissingsproces. Zodoende hebben aandachtsfunctionarissen een belangrijke rol in de richtlijn. Daarnaast bleek het beslissingstraject langer te duren dan werd aangeraden in de richtlijn. Het besluit werd genomen om een instrument te maken dat elke stap in het beslissingsproces ondersteunde. Deelnemers vonden daarnaast dat het instrument duidelijk moest zijn. Een belangrijke barrière was een gebrek aan tijd om het instrument te gebruiken.

Deze prototypes werden getest in een tweede serie interviews, gebruik makende van dezelfde groep eindgebruikers. De prototypes werden over het algemeen positief ontvangen en erg duidelijk gevonden. Weinig aanpassen werden door de deelnemers nodig geacht. Verrassend genoeg hadden deelnemers in de eerste serie interviews om de integratie gevraagd van het beslisdiagram van de richtlijn – maar dit component werd slecht ontvangen, en onduidelijk en niet ondersteunend gevonden.

Inmiddels wordt het instrument verder ontwikkeld door software-ontwikkelaars.

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1. Introduction

1.1 Overview of Child Abuse

1.1.1 Definition

Child abuse is a very sensitive subject. The reason for this is not merely due to negative connotations associated with child abuse, but lies in the definition of the concept of 'child abuse' as well. Whereas a slap might be seen by one parent as abuse, it may be deemed by another to be firm parenting. This situation necessitates a clear definition. This thesis focuses on child abuse in the Netherlands; accordingly the definition of the Dutch law is used:

"Child Abuse: any form of a, for a minor, threatening or violent interaction of physical, psychological or sexual nature, wherein the parents or other persons with respect to whom the minor is in a relationship of dependency or constraint, actively or passively intrude, causing serious damage being caused or is likely to be caused to the child in the form of physical or psychological injury" (Wet op de Jeugdgezondheid of 2004, article I, § 1).

This definition shows that the complexity of the concept of child abuse. The definition extends further than only physical interactions, as it also includes psychological and sexual interactions. The physical and psychological interactions are furthermore subdivided in active (abuse) and passive (neglect) categories. As such, there are five distinct types of child abuse (Wagenaar-Fischer et al., 2010).

- Physical abuse means there is physical aggression directed to the child. This might be hitting or kicking the child, or letting young children fall intentionally or shaking them.
- Physical neglect refers to the failure of parents to properly attend to the child's physical wellbeing. This may constitute a lack of food, clothes or hygiene; or taking no care of the child's safety with regards to surroundings or medical needs.
- Psychological abuse includes, but is not limited to, verbal aggression, humiliation and social intimidation. This can be directed either at the child or at another person while the child is present.
- Psychological neglect consists of a failure to give proper positive attention to the child. This type also includes not allowing the child to attend school.
- Sexual abuse includes the pressuring the child to engage in sexual activities with the adult or adolescent.

These five different types of child abuse may take place at the same time (Browne, Hanks, Stratton and Hamilton, 2002; Van IJzendoorn et al., 2007). The various categories, and inconsistent use of the definition (Alink et al., 2010), hamper the task of mapping out the current extent of child abuse in the Netherlands. Further problems arise due to the method of measurement.

1.1.2 Prevalence

For years, it was assumed the prevalence in the Netherlands was similar to the prevalence of child abuse in the United States of America. This led to year-prevalence estimates of roughly 50.000-80.000 cases, which equals 14 to 22 cases of child abuse on every 1000 children (Van IJzendoorn, 2007). To improve on this estimate, a study was performed to determine the prevalence of child abuse in the Netherlands (Van IJzendoorn et al., 2007). This study used 1100 informants (e.g. professionals in health care and child care) and led to a year-prevalence of 107.200, with a confidence interval of roughly 5000, or 30 ± 2 in every 1000 children.

Instead of using informants as intermediaries, Lamers-Winkelman, Slot, Bijl, and Vijlbrief (2007) asked 1845 teenagers (between the ages of 11 and 18) whether they had experienced abuse. A lifetime-prevalence of 373 per 1000 children was found, as well as a year-incidence of 195 per 1000 children. This estimate is substantially higher than the prevalence found by IJzendoorn et al. (2007).

In 2010, a follow-up study was undertaken to determine how the prevalence progressed (Alink et al., 2010). This consisted of measurements using both informants and teenagers. Reports by informants resulted in an estimated year-prevalence of 34 cases per 1000 children. The estimate based on teenagers' reports was significantly higher, reporting a year-prevalence of 187 cases per 1000 children. Different definitions for child abuse were used for teenagers and informants. When Alink et al. (2010) corrected for this, the year-prevalence reported by teenager's decreased to 99 cases per 1000 children.

The different studies show widely varying prevalence rates. Whereas studies based on informants put the number at roughly 30-35 per 1000 children, those based on data by students are up to six times higher. Even using the lowest estimate, of 30-35 per 1000 children, the extent of the problem of child abuse is substantial. To understand the full extent of a problem, one should not merely consider the prevalence, but also the associated consequences.

1.1.3 Consequences

The exact consequences of child abuse are hard to outline. Both the type of consequences and their magnitude may vary widely on a case-by-case basis. The magnitude of consequences depends on various variables, such as (but not limited to) the magnitude of the abuse itself; the age of the child, the frequency and duration of the abuse; the existence or lack of support from the child's environment; and the child's personality (Wolzak & Ter Berge, 2008).

The type of consequences can be either physical or psychological. Both types can take on various appearances. Physical harm ranges from bruises to permanent damage, and even occasional fatalities. Numbers on yearly fatalities attributable to child abuse are hard to come by. A paper by Kuyvenhoven, Hekkink & Voorn (1998) puts the number around 40 per year, although new research indicates this estimation might be too high (Knoeff-Gijzen, 2013).

Abused children can exhibit various psychological problems as well. Some children become more aggressive and antisocial, whereas others retreat and become quieter; either can have a negative influence on their relation with peers. Moreover, child abuse can have effects later in life, potentially resulting in Post Traumatic Stress Syndromes, addictions and dissociative disorders (Wagenaar-Fischer et al., 2010; Wolzak & Ter Berge, 2008).

Some consequences can be quantified, in order to approximate the financial costs that child abuse bears on society. Wagenaar-Fischer et al. (2010), referring to Meerding (2005), reported the costs of child abuse in the Netherlands over 2003 to exceed 900 million euro's. This is divided between direct costs and indirect costs. Direct costs, such as medical psychological care, are estimated to be at least 175 million euro's; whereas indirect costs, such as juvenile delinquency, are estimated to be 789 million euro's. Although these estimated costs are already substantial, they are limited to costs that can be quantified. Indirect costs such as decreased economic productivity and the immaterial costs of the child's suffering are not taken into account.

1.1.4 Prevention of Child Abuse

Evidently child abuse is a substantial problem in the Netherlands, which should be prevented as much as possible. In health promotion three types of prevention are differentiated, based on their underlying goal (Brug, Van Assema and Lechner, 2007). Primary prevention concerns preventing the problem altogether, for instance by removing risk factors or causes for the problem. Secondary prevention relates to early identification of the problems, so that appropriate steps can be made in order to prevent worse outcomes. Finally, tertiary prevention starts after a diagnosis has been made

and deals with controlling the problem and removing the negative consequences of the existing problem.

So far numerous studies regarding primary prevention of child abuse have been done, and are still being undertaken in the Netherlands (for an overview, see: Klein Velderman and Pannebakker, 2008). Moreover, in 2007, the ministry of J&G (cf. Youth & Family) made an action plan detailing various measures to reduce child abuse (J&G, 2007). One of the main components is the so-called RAAK-method (Reflection and Action-group to Tackle Child abuse), wherein large scale interventions are disseminated on a regional level (J&G, 2007; Mutsaers, 2008).

Although this primary prevention is very important, so is early detection. Given the previously mentioned complexity of child abuse, the signals indicating child abuse may be very subtle (Wagenaar-Fischer et al., 2010; Van Leerdam, Kooijman, Öry and Landweer, 2003). Due to this, informants such as teachers and physicians are employed to pick up on signals. For these professionals, it is important that they know exactly what to look out for. In order to support them in this task, various unions of professionals have devised guidelines and codes. Examples of these include a code for physicians by the Royal Dutch Medical Association (KNMG) concerning Child abuse and Domestic Violence (KNMG, 2012); and a report code for all professionals in Childcare (Tazelaar and Bodenstaff, 2011).

Both physicians and childcare professionals are important for early detection. Physicians are trained to medically examine their patients, and are thus well-equipped to signal child abuse whenever this was the cause of injuries. Childcare professionals on the other hand see the children daily, and will thus be able to detect worrying changes over time. However the strength of either group is the other's weakness. Physicians only rarely see the children, and detecting signs for abuse is not a traditional task for Childcare professionals. This gap is filled by Child Healthcare Professionals (CHPs).

1.1.5 Child Healthcare Professionals

On the basis of the Law of Public Health, municipalities have certain responsibilities to every child between the ages of 0 and 19 by means of the Child Healthcare (viz.: *JGZ*). Summarized in the Basic program of preventive child health care (viz.: *basistakenpakket*), these responsibilities include vaccinations; distributing relevant health information; systematically monitoring children and signalling problems; and supporting parents (VWS, 2002). As such, the CHPs periodically see a large percentage of the Dutch children – in 2012 more than 90% of the children between 0-4 were reached and 80% of the children 4-19 (NCJ, 2012). In those first 19 years a child is seen roughly a dozen times

by a CHP, whereby the majority of the contact moments take place in the first three to four years. The exact amount and timing of contact moments varies per municipality.

Given that a) a large proportion of the children are periodically seen by CHPs, and b) part of a CHPs job is to signal problems early (which is known by parents), the CHPs are in an excellent position to detect possible cases of child abuse early on. In order to support CHPs in this, a guideline (Wagenaar-Fischer et al., 2010) was made regarding the secondary prevention of child abuse, as well as a reporting code (Ministry of Health, Welfare and Sport, 2013). Guidelines appears to have a positive effect on CHPs behaviour as having a guideline to prevent child abuse is related with an increased undertaking of actions (such as reporting to The AMK) among professionals of up to three times (Doeven, 2008)

1.1.6 Reporting Code

Whereas the guideline secondary prevention child abuse is merely recommended, the reporting code is, per July 2013, legally obliging CHPs and other professionals to use the reporting code in case of suspected child abuse. The code consists of five steps. The first step is the identification of signals. This is followed by peer consultation and, if necessary, consultation with the Advice and Reporting Centre for Child Abuse (henceforth AMK). The third step is an interview with the client whereby the worries are voiced. The next step is an assessment of the nature and severity of the suspected child abuse. The final step is organizing help or reporting to the AMK (Ministry of Health, Welfare and Sport, 2013).

1.1.7 Guideline Secondary Prevention Child Abuse

Development of the guideline started in 2003 as a combined effort of several relevant groups of stakeholders such as CHPs, the AMK; and the Netherlands Youth Institute (viz.: NJi) (Broerse, Fleuren, Kamphuis & Van Dommelen, 2009; Wagenaar-Fischer et al., 2010). A concept of the guideline was distributed in 2005 among a group of relevant medical professionals for feedback (Wagenaar-Fischer et al., 2010). As every Child Healthcare guideline is valid for five years, the guideline will be considered for updates in 2014 (Wagenaar-Fischer et al., 2010).

The guideline includes components such as risk factors for, and consequences of, child abuse; recommendations how the CHP should act when suspicions arise; and a juridical framework. To clarify to the CHPs which step should be undertaken next, these actions are summarized in a

roadmap (see Wagenaar-Fischer et al., 2010, p. 54). This roadmap also includes a maximal time-span, to prevent CHPs taking too long in the trajectory of signalling.

The roadmap (See appendix 1) starts with a suspicion of child abuse. This may be the CHPs own suspicion or emanate from a third party source informing the CHP. Then the CHP has to decide whether the child is in immediate danger. If so, it is immediately reported to the AMK. If the child is in no immediate danger the CHP should have a talk with the parents voicing their concerns. In this conversation permission can be asked from the parents to discuss the situation with other professionals (e.g. the child's GP). Afterwards the CHP should talk with a child abuse expert (Aandachtsfunctionaris Kindermishandeling, also known as AKM). Child abuse experts are child healthcare physicians educated in signalling child abuse and are available for colleagues for consultation.

Then the CHP should decide whether the suspicions of child abuse have been confirmed. If suspicions were deemed to be incorrect, the trajectory stops. If these suspicions still exist, the sequence starts anew through a conversation with parents. After at most three conversations with parents a decision should be made by the CHP. If suspicions get confirmed, there are various options depending on the situation. CHPs could offer help themselves; they can refer to an appropriate organisation, or they can report to the AMK. To aid in this decision, the Balance Model can be used. This is a model that helps the CHP to identify all protective factors and risk factors. When these factors have been identified, the CHP should evaluate the balance to decide on the risk the child is in.

When this whole trajectory has been completed, the CHP should have a follow-up with the parents to check whether appropriate help has been started. Three months later, the CHP should evaluate the trajectory and result with the child abuse expert. All actions should be registered in the child's electronic medical record – which the parents are entitled to look into if they want to.

Before the nationwide dissemination of the guideline, there was a test-implementation in four regions between 2007 and 2009. Results from this test-implementation should be met with caution, as the response rate of the CHPs was lower than expected. Although the CHPs had a positive attitude towards the guideline, the self-efficacy for adhering to the guideline's time-span had decreased (compared to an initial estimate by the same CHPs). Furthermore several core-components (such as consulting the child abuse expert, and the follow-up at the end of the trajectory) of the guideline were rarely performed (Broerse et al., 2009). Other reported problems concerned insufficient organizational structures to share information with other organizations; a lack of education regarding the guideline; and a general lack of time to properly adhere to the guideline.

The information of this test-implementation was used for the final 175-page guideline that was finished in 2009 (Broerse, Kamphuis, Kooijman, Vergeer & Beckers, 2012). However no information regarding what changes have been made prior to a wider implementation of the guideline could be found. When the full implementation was evaluated problems were found in the embedding of the guideline in current work processes (Broerse et al., 2012).

1.2 Theoretical Framework

1.2.1 Adherence to Guidelines

A lack of adherence to the guideline among CHPs is indicated by the findings that the guideline is not part of current work practices and that key components are rarely used (Broerse et al., 2012; Broerse et al., 2009). This is not unexpected; the adherence to clinical practise guidelines is typically low – although numbers vary per guideline (Cabana et al., 1999; Grol et al., 1998). In order to improve guideline adherence, it is therefore worthwhile to map the various reported barriers. . For the sake of clarity, the full adherence to a guideline is divided into three parts: having a guideline to follow; following the recommended actions; and registering these actions.

1.2.1.1 Barriers to Guidelines

Given the diversity of different guidelines, Cabana et al. (1999) grouped barriers into different categories. Seven categories of barriers were found: lack of awareness; lack of familiarity; lack of agreement; lack of self-efficacy; lack of outcome-expectancy; inertia of previous practice; and external barriers. They found that for a fair amount of guidelines (78%) more than 10% of the physicians were not aware of the guideline's existence. Although exact numbers were lacking, presumably the lack of familiarity with the guideline was even more prevalent than the lack of awareness.

Another review (Carlsen, Glenton & Pope, 2007) to classify barriers into themes found different barriers though, citing the questioning of the guideline's content; the guideline's format; GPs experience (with the guideline); preserving the doctor-patient relationship; professional responsibility; and practical issues. Furthermore, the found barriers differed among GP's depending on the guidelines purpose – whether it was to encourage or to discourage certain treatments or behavior (Carlsen, Glenton & Pope, 2007).

Quaglini (2008) adds several more reasons why physicians may not adhere to guidelines. One such reason is that guidelines are only ever for the average patient, whereas optimal care will differ for specific cases. This means the guideline cannot encompass all situations – possibly causing the user to see the guideline as less valid. Other given reasons for non-adherence are a lack of self-efficacy and a lack of outcome expectancy. These reasons are comparable to those reported by Cabana et al. (1999).

A study concerning various guidelines among Dutch GPs showed the main barriers were a lack of agreement with the guideline recommendations; a lack of familiarity; and a lack of clear guideline recommendations (Lugtenberg, Zegers-van Schaick, Westert & Burgers, 2009).

1.2.1.2 Barriers to Following Recommendations

Adhering to guidelines also means that CHPs will be advised to follow recommended actions. Research in this area has been done under the banner of Clinical Decision Support (henceforth CDS). With CDS is meant 'providing clinicians or patients with computer-generated clinical knowledge and patient-related information, intelligently filtered or presented at appropriate times, to enhance patient care' (Osheroff et al., 2005). Although benefits on patient level outcomes are scarce, there is substantial evidence for a positive impact on physicians' performance (Pearson et al., 2007; Jaspers, Smeulers, Vermeulen & Peute, 2011). Even so, many barriers have been reported.

Sittig et al. (2008) identified ten challenges that needed to be solved to increase the quality of CDSs. As these challenges were devised for an array of stakeholders involved in the development of CDS, not all challenges are relevant for the design of such an innovation. According to Sittig et al. (2008), the interface should be unobtrusive but effective. If possible it should be placed seamlessly in the workflow. Other challenges are more specific in nature – such as the suggestion to increase the use of brief summaries concerning the clients past and current medical status; and using information currently left in free text fields, for instance by automated text processing. Furthermore, Sittig et al. (2008) recommend limiting the number of recommendations that the clinician gets, so to prevent clinicians wasting time and attention on incorrect prompts. This should limit 'alert fatigue', that may otherwise be a cause for dissatisfaction with the innovation.

Other studies take a similar view as Sittig et al (2008), searching for the best match between user and recommendations in order to improve adherence to the actions recommended by the CDS. As such one of the most important barriers for this adherence was an insufficient fit of the recommendation alters in the current workflow of physicians (Bates et al., 2003; Kawamota et al., 2005). It was

considered vital that the recommendations were provided at the time and location of the decision making (Kawamota et al., 2008). This should minimize the alteration of the user's workflow, thereby requiring minimal time. Speed is everything (Bates et al., 2003, p. 524).

Physicians, when asked about their use of CDS, reached similar conclusions. Rather than seeing the recommendations as an improvement, physicians occasionally reacted positively when they were not being disturbed by them (Kortteisto et al., 2012). The barrier of perceived lack of time for recommendations was reiterated as well (e.g. Kortteisto et al., 2012), with physicians remarking they were often behind schedule, and less prone to accept recommendations in those cases (Sittig et al., 2006). Furthermore, physicians were less open for recommendations when they perceived the recommendation as a threat to their professional autonomy or doctor-patient interaction (Moxey et al., 2010).

1.2.1.3 Barriers against Registering

All actions that CHPs undertake should be registered (Wagenaar-Fischer et al., 2010). Barriers to registering have been studied in the area of Electronic Medical Records (EMRs). EMRs are 'computerized medical information systems that collect, store and display patient information' (Boonstra & Broekhuis, 2010). According to Rose et al. (2005), the resistance of physicians is one of the largest barriers to the adoption of Electronic Medical Records. Different types of resistance are mentioned, such as computer anxiety, increased time, decreased interaction with patients, and lack of integration with physician workflow (Rose et al., 2005).

Michel-Verkerke & Spil (2013) nuance this view, adding that these are not 'genuine' causes of resistance (as opposed to for instance 'low tolerance of change'). Instead, the barriers identified by Rose et al. (2005) signal either that the innovation is not relevant for the user, that it does not meet user's requirements, or that it takes too many resources (such as time).

The barriers of the additional time that needs to be spent and a lack of fit with current clinical practices are mentioned in many reviews and studies as important barriers (e.g. Karsh et al., 2006; Yarbrough & Smith, 2007; Lenz & Reichert, 2007; Boonstra & Broekhuis, 2010). To decrease the amount of time spent Lenz and Reichert (2007) therefore suggest using pre-filled checklists. Another reported barrier were physicians' qualms about the degree of confidentiality of the registered data (Karsh et al., 2006; Boonstra & Broekhuis, 2010; McGinn et al., 2011).

1.2.1.4 Resolving Barriers

Various factors can thus be identified as barriers to proper adherence by CHPs. Barriers to guidelines were diverse, such as a lack of familiarity with the guideline. Factors of non-adherence to recommendations related mainly to a lack of time among physicians and a lack of fit in the current workflow. These latter two factors were often named as barriers to registration as well.

Low adherence to guidelines, to following recommended actions, and to registration, has negative consequences (Stals, 2012). Most important among these is the possibility that avoidable damage is done due to late signalling or incorrect actions undertaken by the CHP. Given that the best care for children is the primary aim of CHPs (VWS, 2002), non-adherence to a guideline directly undermines this aim. As such, it's vital to resolve these barriers in order to improve guideline adherence.

Various options can be tried to resolve these barriers. As a lack of time is often seen as an important barrier, it would be theoretically possible to give CHPs more time for contact moments. Such tries have been tried for different guidelines (Stals, 2012) – but these initiatives run into other troubles, such as the inability of organisations to grant CHPs more time.

Instead, for this situation the choice was made to devise some type of innovation. Ideally this innovation could offer the right information at the right time – thereby reducing the barrier of lack of familiarity. Moreover, it may help embed the guideline into the current workflow, and potentially even safe the CHPs some time. The innovation would thus alleviate the identified barriers, thereby ultimately supporting CHPs in adhering to the guideline.

Furthermore, the use of a digital innovation has had precedence in health care in recent years. As mentioned previously, Electronic Patient Records have been introduced to support the registering process of clinicians; and Clinical Decision Aids support the clinician in taking decisions, for instance regarding appropriate medication. Given the electronic registering is already compulsory for Dutch CHPs, it would be a logical next step to extend the registration by means of a guideline-specific innovation. Moreover, combining the innovation with the act registration would probably help embedding the guideline into CHPs work routines.

Although barriers to guideline adherence have been identified, and the decision has been taken to design some type of innovation, the knowledge how the innovation should overcome the barriers still lacks. What technical innovations should do (and should not) in order to be effective has been researched in the area of Persuasive Technology.

1.2.2 Persuasive Technology

1.2.2.1 Various Classification Systems

Over the years, many different techniques have been tried to persuade people. The exact number of possible tactics is hard to define though. In a review of 53 papers, Wiafe & Nakata (2012) identified 56 different mentioned techniques – but found that many researchers used ad hoc definitions. This indicates a lack of an agreed-upon classification structure; implying similar techniques have various names. In order to reduce this obscurity, various frameworks exist to classify persuasive techniques.

Cialdini (2001) recognizes six different persuasive strategies: reciprocity; scarcity; authority; commitment & consistency; consensus; and liking. These strategies seem to be useful in marketing (e.g. Kaptein, 2013). These strategies focus on having the innovation appear as positive as possible. As the current innovation has to actively support CHPs as well, another focus – centered more on the innovations functionality – is more applicable. This focus can be found in the taxonomies of Fogg (2002) and Oinas-Kukkonen & Harjumaa (2009), which share many components with each other.

Fogg (2002) lists 42 different persuasive principles. The model of Oinas-Kukkonen & Harjumaa (2009) includes 28 of these principles, but categorizes them into 4 different categories of persuasive components – with 7 components per categories. These categories are Primary Task Support; Dialogue Support; Social Support; and System Credibility Support (Oinas-Kukkonen & Harjumaa, 2009).

For the purpose of this research, the taxonomy of Oinas-Kukkonen & Harjumaa (2009) will be used. The collection of components by Fogg may be more extensive (and there are broader taxonomies still, e.g. Rhoads, 2007, claims in access of 160 tactics). On other hand, the classification by Oinas-Kukkonen & Harjumaa (2009) adds additional insight concerning which principles may work in similar ways.

1.2.2.2 Persuasive Systems and Adherence

Recently, several articles have been published regarding the relation between various intervention factors and adherence of users. One of the reviews (Kelders, Kok, Ossebaard & Van Gemert-Pijnen, 2012) included a multiple linear regression of various variables on adherence to web-based interventions. Parts of the variables in this analysis were the persuasive component-categories by Oinas-Kukkonen & Harjumaa (2009). Although the final model explained 55% of variance in adherence, only the category of Dialogue Support was statistically significant (of the component categories).

Given that different studies and reviews focus on different potentially persuasive components in varying setting, conclusions are hard to draw. A study of Crutzen, Cyr & De Vries (2011) attempted to model end-users perceptions resulting in e-loyalty, that is: the intention to visit the program again and recommend it to others. The study found effectiveness (the quality and relevance of information offered) and enjoyment to be positively related to loyalty – although surprisingly no evidence was found for a relation between efficiency and loyalty (the access to the information) and trustworthiness of the source (Crutzen et al., 2011).

1.2.2.3 Useful persuasive components

As little is yet known about component-categories, separate components will be discussed in-depth. For this innovation the categories of Primary Task Support and Dialogue Support will be most relevant. Primary Task Support directly deals with supporting users in their tasks. As noted previously, this support is central to alleviate barriers and thereby increase CHPs guideline adherence. Dialogue Support is concerned with the feedback between innovation and its user. This category will therefore be useful if the innovation were to communicate information about the guideline, or suggest a next action to undertake.

1.2.2.3.1 Tunneling

This Primary Task Support-component means the user is guided though a process (Oinas-Kukkonen & Harjumaa, 2009). This technique had a positive effect in a study by Crutzen, Cyr & De Vries (2011) on several factors of program use, such as time spent and knowledge afterwards compared to an equivalent intervention without tunneling. Although these results are encouraging, users rated their perceived efficiency lower after they'd experienced tunneling. The interpretation, of the apparent contrast of increased knowledge (relative to a version without tunneling) with perceived lower efficiency, was that the idea that the user is in control of the process is more important than actual control by the user (Crutzen, Cyr & De Vries, 2012). Care should therefore be taken with the amount of user control.

1.2.2.3.2 Tailoring

A review concerning the factors to enhance user engagement (Schubert, 2011) suggests that innovations should be adapted to the users' needs, include dynamic content and determine if specific variables predict attrition or low compliance. Adapting intervention specifically to the users'

needs is known as tailoring. Such interventions have been shown to be more effective than generic interventions (Noar et al., 2007; Baker et al., 2010).

The suggestion by Schubert (2011), to let interventions change themselves, goes farther than that. This idea has been worked out several times so far in a marketing setting (e.g. Hauser et al., 2008; Kaptein et al. 2009) – but little research has been done to promote health behavior. As Kaptein et al. (2009) show, the use of incorrect persuasive strategies can have a detrimental effect for individual users, implying that dynamic tailoring at the individual level may be necessary.

1.2.2.3.3 Reminders

Reminders are messages that reminder users about their target behavior process (Oinas-Kukkonen & Harjumaa, 2009). A systematic review on the effects of reminders among clinicians (Holt, Thorogood & Griffiths, 2012) showed an overall positive effect for reminders. Another systematic review found much smaller results than generally expected – and reported only an absolute improved adherence of 4.2% (Shojania et al., 2010). This small positive effect on adherence could be increased to 12.9% when a response was required (compared to 2.7% when no response was required), however this difference was not statistically significant ($p = .09$) (Shojania et al., 2010). A review concerning effective strategies in Dutch Youth Care grouped 'reminders' as consistently effective. No other persuasive techniques were mentioned – neither was an indication how effective reminders have proven to be, in this setting (Stals, 2012).

Although reminders as shown tend to have some positive effect, there is a downside as well. Users may find the reminders too obtrusive (Ahearn & Kerr, 2003; Weingart et al., 2003) and may be seen as a hindrance when messages are triggered too quickly or for incorrect reasons (Kortteisto et al., 2012; Ash et al., 2007). Moreover, with workload being already an often-mentioned barrier (e.g. Sittig et al., 2006; Moxey et al., 2010), the time wasted due to ill-timed reminders or false alarms is seen as an essential problem (Patterson et al., 2004).

1.2.2.3.4 Liking

With people spending only a very limited amount of time to assess a program, the visual attractiveness may be of high importance (Lindgaard et al., 2006; Brouwer, 2011). A study by Hauser et al. (2008), researched a website which altered itself according to the user's click behavior. Hauser found a substantial positive effect size (1.82) for visually attractive graphical representations (as opposed to a verbal representation). On the other hand, screens with the highest information load

had the largest negative effects (-1.85). This implies that visually attractive pages that contain limited information, work best to keep users from dropping out of the instrument.

1.2.2.3.5 Combining various components

There is yet little knowledge concerning which persuasive techniques combine well. Some techniques tend to be used together, such as reminders and suggestions, or tailoring and personalization (Cugelman et al., 2011). These co-occurrences however appear to be due to ill-defined definitions rather than conscious combinations (Wiafe & Nakata, 2012).

Moreover it seems unclear whether the addition of various persuasive techniques actually has a positive effect on the effect of the innovation. A review by Cugelman et al. (2011) noted that a larger number of persuasive components tended to have larger effect sizes – but this relation was not significant. Another, unpublished, review concerning the influence of persuasive design on the effectiveness of web-based interventions for chronic conditions found no such relation however (Joosse, 2012). Furthermore, extensive research by Kaptein (2013) indicated that, for Cialdini's techniques in marketing, the addition of components may even decrease an initial effect.

1.2.3 Models for Adoption and Implementation

The knowledge from persuasive technologies indicates what techniques may be useful to increase CHPs adherence. However, the success of an innovation isn't merely defined by these components. Other constraints, such as the interoperability with other used systems, may be of influence as well. It would be of no use to have a theoretically effective innovation, if it is not adopted subsequently. By adoption we mean "the decision to make full use of an innovation as the best course of action available" (Rogers, 2003, p. 21). As Van Gemert-Pijnen et al. (2011) advocate, the development of a technology should closely intertwined with its implementation. It is therefore worthwhile to consider several relevant frameworks detailing this adoption and implementation.

1.2.3.1 General Adoption Models

Rogers' broadly pertinent book Diffusion of Innovations (2003) distinguishes five consecutive steps in the decision to adopt an innovation: knowledge, persuasion, decision, implementation and confirmation (Rogers, 2003). In this case, confirmation means the reassessment of the adoption or rejection. These steps have got implications how the application should be designed.

First of all, knowledge of the innovations existence should be spread. The second step is persuading the CHPs that this innovation is a better choice than current practice. This step is typically where persuasive techniques, for instance those defined by Cialdini (2001), come into play. The third step, the decision whether or not to adopt the innovation is one that should be influenced by the former step. The fourth step, implementation of the decision, means that innovations have to be implemented current work-routine. Finally in step five the user has to continue using the innovation. For the current situation, the following three issues have to be taken into account: how to have the innovation *seem* like a better choice (step 2); how to integrate in current work routines (step 4); and how to have the innovation *be* experienced as the better choice (step 5).

In order to help persuade the potential user to initially adopt the system, Rogers (2003) acknowledges five attributes to keep in mind: 1) relative advantage, 2) compatibility (with values, experiences and needs of the user), 3) complexity, 4) trialability, and 5) observability (of the results of the innovation). These attributes have been adapted for the diffusion of innovations in health care by Cain & Mittman (2002). They took four of Rogers' attributes (leaving out 'complexity'), and added factors such as infrastructure and the availability of opinion leaders.

A Dutch literature and Delphi-study concerning the determinants of innovation within health care organizations adds even more factors. A total of 50 determinants were identified to affect the innovation process – which combined for a total explained variance of 15% (Fleuren, Wiefferink & Paulussen, 2010).

Both studies are highly relevant for the current innovation, as both centered on innovations in health care. The article of Fleuren et al. (2004) is even aimed at innovations in health care organizations. The method of gathering influencing factors, utilized by both articles, is especially useful as checklist in order to ascertain no potentially influential components have been left out. For the current situation, wherein a whole new innovation was developed, it was deemed to be more beneficial to use a framework directly based on theoretical foundations. On such models is the USE-IT-adoption model by Spil and Schuring (2006).

1.2.3.2 USE-IT-adoption model

The USE IT-adoption model (see FIGURE 1) was originally proposed by Spil and Schuring (2006), in order to investigate the adoption of information systems in healthcare, and subsequently revised based on several case-studies (Michel-Verkerke & Spil,2013). The USE-IT-adoption-model uses two umbrella dimensions: the innovation dimension (distinguishing between 'product' and 'process') and the domain dimension (distinguishing between the 'user domain' and the 'technology-domain').

These two dimensions together form four determinants on their intersections, namely relevance, requirements, resources and resistance.

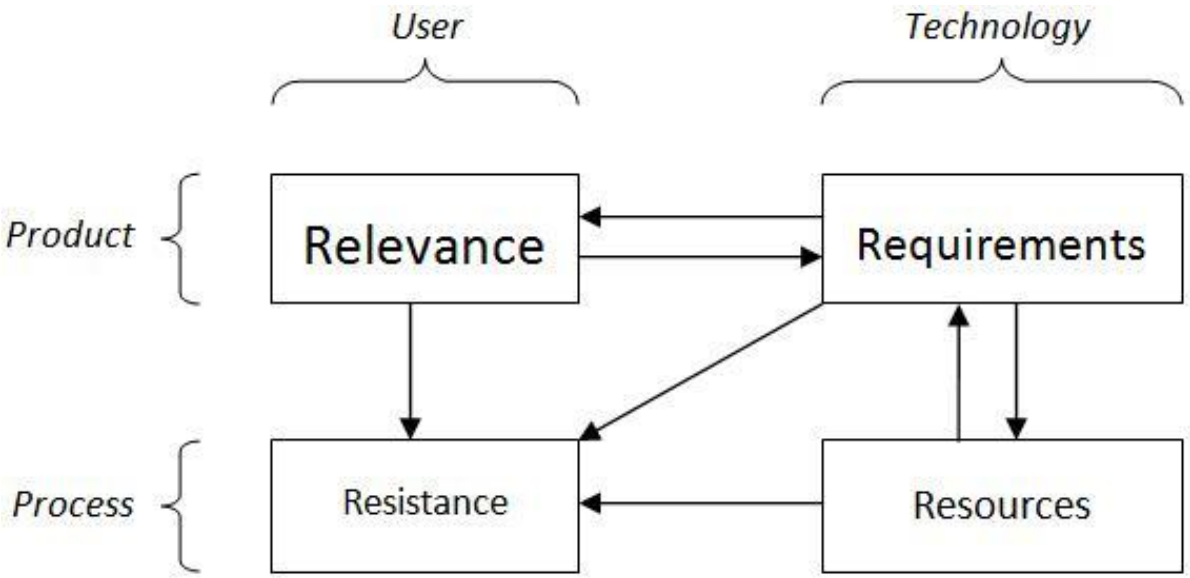

Figure 1. The USE IT-adoption Model (Michel-Verkerke & Spil, 2013). Font sizes of determinants reflect their relative importance. The constructs Product and Process compose the Innovation-dimension; the constructs User and Technology compose the Domain-dimension.

Each determinant is defined on two levels; a macro-level referring to an organizational or group level, and a micro-level referring to the individual end-user. For the design of the current application, the micro-level will be most relevant. This level can be influenced most effectively, and should furthermore be the most important level given that it's the end-users' adherence that the innovation aims to increase.

1.2.3.2.1 Determinants of the USE IT-adoption model

'Micro-relevance' is defined as the degree to which the ICT-system helps to solve the here-and-now problem of the user in his working process and provide benefits (Michel-Verkerke & Spil, 2013). The determinant encompasses several sub-dimensions: task support, effective care, efficient care and client satisfaction.

The determinant 'micro-requirements' concerns the technical side of relevance, and is defined as the degree to which the individual user needs are satisfied by the ICT-system. This determinant includes the sub-dimensions information quality; accessibility; compatibility (with the working process); interface satisfaction; and interoperability (with existing systems).

The determinant 'micro-resources' is defined as 'the degree to which the individual user is capable of using the ICT-system'. It consists of a material sub-dimension (access to infrastructure / technical resources) and two immaterial sub-dimensions: the capability of the end-user and their experience/education.

'Micro-resistance' is defined as 'the degree to which the individual user rejects (does not adopt) the ICT-system'. This determinant consists of three sub-dimensions: lack of trust; low tolerance of change; and negative consequences.

1.2.3.3 Most useful determinants

The focus of the current application lies mainly with the determinants of the the 'product'-dimension: relevance and requirements (see figure 1). This has two reasons. First of all, both determinants that are contained in this component (i.e. relevance and requirements) were found to be more influential for the adoption of innovations in healthcare than either of resources or resistance (Michel-Verkerke & Spil, 2013). Furthermore, the current context concerns the design of an innovation. As such the focus of the design lies with the attributes the innovation should have (relevance); and the matter of translating this into technical constraints (requirements).

1.2.4 Summarizing the theoretical framework

Finalizing the theoretical framework, a short summary will be given denoting the most important findings from literature for the current situation.

1.2.4.1 Summary of Non-adherence to guidelines

Barriers to guidelines varied widely per guideline. Recurring barriers were a lack of familiarity, lack of self-efficacy, lack of agreement with the guideline, lack of outcome expectancy, lack of clear recommendations and a lack of time. Not preserving the doctor-patient relationship was seen as a possible barrier as well. Barriers to following recommendations were mainly lack of time and an inadequate fit with current work practices. Moreover, the recommendation alert shouldn't threaten the doctor-patient relationship. Barriers to registration concerned a lack of time; lack of familiarity; and lack of interoperability. There were furthermore worries about confidentiality of patient information.

1.2.4.2 Summary of Persuasive Technologies

Tunneling turned out to be a possible option, leading the CHP through more extensive processes. Tailoring was possibly effective – especially if the application could tailor itself dynamically. Reviews were cautiously positive about the use of reminders. Downsides were noted as well, such as the danger of interrupting working practices and alert fatigue among CHPs due to too many, or incorrect, alerts. Making the application visually attractive was seen as a possible prerequisite to guard against early dropout attrition. The added value of combining various techniques is still largely unknown.

1.2.4.3 Summary of Implementation and adoption theories

Implementation literature added the insight that for appropriate adoption the application should seem better than current practice; be well integrated with current systems; and be better than current practice. The USE-IT model stated the most important determinants for adoption were relevance and requirements.

1.3 Involving end-users

In order to increase CHPs guideline adherence, the decision has been made to develop a supporting innovation. Furthermore potential barriers have been identified, as well as possible technical components to overcome these barriers. This has been accentuated by an outline of factors that may influence the implementation of an innovation. Currently still lacking is the perspective of potential end-users.

The perspective of end-users complements findings from literature and is of vital importance in the development of interventions in Dutch preventive child healthcare (Stals, 2012). Furthermore the input of users plays an important role in the design of eHealth innovations (Van Gemert-Pijnen et al., 2011; Van Velsen, Wentzel, Van Gemert-Pijnen, in press). The advantage of involving end-users in the design process is that it increases the chance the innovation will fit in current work practices, and that the innovation is aimed at problems currently experienced by users (Stals, 2012). The involvement of users is therefore imperative to increase adherence to the innovation, and consequently adherence to the guideline.

1.4 Research Questions

The subjects that need input from participating end-users are derived from literature discussed in the section 1.2 Theoretical Framework. According to the USE IT-adoption model (see section 1.2.4.2) the

relevance, of the innovation for users, is of vital importance for the innovation's adoption. In order to be relevant, the innovation should solve current problems with the guideline (Michel-Verkerke & Spil, 2013). End-users will therefore be asked about their current experience with the guideline, and what problems they encounter using the guideline.

> Research Question 1: What problems do Dutch Child Healthcare Professionals encounter when using the guideline Secondary Prevention Child Abuse?

Secondly, the guideline should be part of current work practices for CHPs. The innovation should therefore be integrated seamlessly in existing work flows as well. Current work practices for cases of suspected child abuse should therefore be mapped out.

> Research Question 2: What are the current work practices of Child Healthcare Professionals for cases of suspected Child Abuse?

Thirdly, the barriers to using the guideline innovation should be identified. If the innovation itself is not adhered to, then it will not help increase CHPs guideline adherence. Needs and barriers are taken to be opposite of each other for this research question – for instance the need for 'ease of use' is equated to the barrier 'lack of ease of use'.

> Research Question 3: What are the needs & barriers of Dutch Child Healthcare Professionals for a guideline adherence improving innovation?

Finally, the design of an innovation involves third parties – called stakeholders. Stakeholders are all persons or organizations affected by the innovation. Their needs and wishes have to be accounted for, to ensure the development and implementation of the innovation goes smoothly (Van Velsen, Wentzel, Van Gemert-Pijnen, in press).

> Research Question 4: What are the needs and wishes of relevant stakeholders for a guideline adherence improving innovation?

1.5 Goal of the Research

The overarching aim of this research is to support in the secondary prevention of child abuse. A guideline for secondary prevention of child abuse exists for Child Healthcare Professionals (Wagenaar-Fischer et al., 2010). This research will try to improve the guideline adherence of these professionals. In order to reach this aim, an innovation will be developed. This innovation will be based on previous literature, as well as the in-put of relevant stakeholders and end-users to ensure

the innovation is user-friendly. As the guideline is part of the current work practice of CHPs, the innovation should fit seamlessly into the CHPs work flow.

This goal of this paper is therefore to design a user-friendly innovation to increase adherence to the guideline secondary prevention child abuse among Dutch Child Healthcare Professionals, which can be embedded in the current workflow.

1.6 Set-up of Development

A recent paper (Van Velsen, Wentzel, Van Gemert-Pijnen, in press) concerns the optimal way to develop eHealth innovations. This paper will be taken as roadmap for the development of the current innovation.

According to this paper, the identification of end-users and stakeholders starts as soon as the team designing the innovation has been assembled. The next phase concerns the requirement elicitation from both end-users and stakeholders. This elicitation can be done using interviews, focus groups or observations. Subsequently the requirements are analyzed, by translating the raw data into requirements. Finally, these requirements are communicated to programmers, making clear what needs to be made and why. Evaluation of prototypes tends to be done at this step as well – but may take place at an earlier point in time.

These phases will be used in this paper as well. Chapter 2 will be concerned with initial requirement elicitation among end-users and stakeholders. Chapter 3 involves the development of initial prototypes, as well as acceptance testing based on paper prototypes among end-users. Chapter 4 summarizes the results from both interviews and draws conclusions. Finally Chapter 5 contains a discussion on the results that were found.

2. Interview series 1

2.1 End-user and Stakeholder identification

As reported by Van Velsen, Wentzel, Van Gemert-Pijnen (in press), the first steps of designing a new eHealth innovation consist of end-user and stakeholder identification. The context of this innovation was a professional setting, so that the identification of end-users was clear-cut. The whole end-user population consisted of nurses and physicians working as Child Healthcare Professionals.

As stakeholders are any other parties influenced by the innovation, an inventory was made regarding which third parties were deemed to be necessary in the development of the innovation. Identified stakeholders were the staff physician of the Healthcare organization; the Dutch Centre of Youth Health (viz.: NCJ); and the developers of the healthcare organization's electronic registering system. The Dutch Centre of Youth Health has a central role in the development of national guidelines in Dutch Youth Healthcare, and was identified to give a view on needs and demands from the point of view of the guideline. Ideally the innovation would be embedded in the child registration system of the healthcare organization – so the developers of this system were identified as important stakeholders as well.

2.2 Requirements Elicitation

The next phase in the development of eHealth innovations is requirement elicitation (Van Velsen, Wentzel, Van Gemert-Pijnen, in press). The most popular elicitation methods are interviews, focus groups and observations. In the current context semi-structured interviews were deemed to be the most worthwhile option.

Semi-structured interviews are a combination of structured and unstructured interviews. Prior to the interview, an interview scheme has been made with general topics and questions that should be answered at some moment during the interview. Unstructured interviews on the contrary tend not to have prearranged questions, while the rigorous interview scheme of structured interviews does not allow for diversions. Semi-structured interviews therefore combine the strengths of both methods by allowing interaction between interviewer and participant adding flexibility in subjects and question, while at the same time guaranteeing that earlier decided upon subjects are discussed. (Goguen & Linde, 1993). Furthermore semi-structured interviews are especially suitable to map out precisely how processes, such as current work practices, take place (Ambrosini & Bowman, 2001).

2.3 Participants

2.3.1 End-users

Interviews were all held in a single healthcare organization of about 180 CHPs. The protocol had been introduced in this organization in 2010 – so that CHPs would have had the opportunity to use the protocol.

A convenience sample of participants was used. This was because obtaining interviewees was expected to be hard, as similar previous research in the same target-population met with low participation (Konijnendijk, 2013). Because of this expectation, combined with a limited sampling pool, a random sampling technique would most likely not have obtained enough interviewees.

All participants took part voluntarily. Information concerning the study and its goals had been distributed through a general letter as well as a message in the organization's newsletter. Moreover the managers of all CHP-teams were asked to inform their team-members about the study. Participants were compensated in time. No preparation was necessary by participants.

To reduce bias, the sample was stratified (i.e. divided into mutually exclusive subgroups) based on chosen variables that may confound. Two distinctions were made; one between nurses and physicians, the second based on the age-groups of children they saw (0-4 versus 4-19 years old). This combined for four distinct subgroups. Three participants were sought for each subgroup for a total of 12 participants. If more than three participants in a category signed up for the interviews, only the first three were admitted. Not all categories could be completely filled with the desired three participants (see table 1). Especially CHPs in the age-category of 4-19 had a low participation rate. All participants were woman. Three of the participating physicians were child abuse experts as well.

Table 1. Number of participants per profession and age-group

	Nurses	Physicians
Ages 0 – 4	3	3
Ages 4 - 19	1	2

2.3.2 Stakeholders

Interviewed stakeholders were the staff physician of the Healthcare organization; a representative the Dutch Centre of Youth Health (viz.: NCJ); and two representatives of the developers of the healthcare organization's electronic registering system.

2.4 Procedure

Interviews were held from November 2012 until February 2013. Interviews took place at a time and place of the participants choosing (in order to reduce the burden on participants). All interviews took roughly one hour, and were tape-recorded with the interviewer making additional notes.

Interviews started with a short introduction regarding the research goals and general information such as that the interview would be audio-taped and that the data would be processed anonymously. Participants were able to ask for further clarifications at this stage. Then the interview continued in a pre-established semi-structured fashion (See Appendix 1). As section 1.4 reported, the questions posed concerned the subjects of experiences and problems with the guideline, current work practices, and needs and barriers for a guideline supporting innovation.

When all subjects had been covered, or time was running out, the participant was asked to remark on any untouched subjects. As Goguen and Linde (1993) note, the danger of interviews is that the interviewer only gets answers on questions that have been asked. Consequently valuable information may stay hidden. Asking participants to comment on anything they considered relevant was thought to protect against this danger.

2.5 Analysis

All audio-taped interviews were transcribed by the interviewer. Furthermore all participants were anonymized using a code that included their profession, age-group tended to, and a number to identify them within the category. For instance N04A meant the participant was a nurse, age-category 0-4 and participant A of the three participants in that category.

All meaningful units were extracted. Meaningful units were everything that captured something important in relation to the research questions (Braun & Clarke, 2006). The smallest unit coded was defined as a word; the largest possible unit coded was a paragraph. These user expressions were summarized, and subsequently attributes were determined for each quote – as recommended by Van Velsen, Wentzel, Van Gemert-Pijnen (in press). Attributes contain the essence of the user expression, and allow the comparison of expressions by different users. All attributes were checked to ascertain they were correct, and adjusted if necessary. Whenever possible, technical requirements were linked to the attribute category. User-expressions were sorted based on attribute categories, so to make it possible to see which expressions were said most often. Finally, all expressions that were mentioned by three or more participants were checked to see whether they were mainly mentioned by nurses or physicians; or 0-4 or 4-19 participants.

The order of analysis was interview after interview (rather than equivalent questions between interviews). This was the most logical order given subsequent questions in the same interview could show substantial overlap. Because the stakeholders resulted in a mere handful of extracted meaningful units, their results were analyzed alongside end-users.

2.6 Results

2.6.1 Current Practice

Two nurses mentioned they did not use (or forgot to use) the protocol. More widespread (4x) was a lack of use of the child abuse experts, although these experts are seen as central to the protocol. This problem had been observed by child abuse experts as well; one of the participating child abuse experts mentioned she sometimes forgot to contact another child abuse expert when suspicions of child abuse arose. Several general reasons for this expert non-use were offered; ranging from forgetting the experts to not seeing their added value.

Table 2. Attributes and Technical requirements of Current Practices

Number and type of CHP expressing attribute		Attribute	Technical Requirement (whenever possible)
N: II Ph: -	0-4: II 4-19: -	Non-use of guideline	
N: II Ph: II	0-4: III 4-19: I	Non-use of Child Abuse Experts	CHPs should be reminded to use child abuse expert
N: III Ph:	0-4: III 4-19:	Current practice: use of contact moments at parents' home	Tool can't be solely for during contact moments – as many are house visits
N: III Ph: -	0-4: II 4-19: I	Current practice: Use of other professionals in network	Tool could support communication with other professionals
N: I Ph: II	0-4: III 4-19: -	Current practice: Building relation with parents	Tool shouldn't intervene with building of relation between CHP and parent
N: II Ph: -	0-4: II 4-19: -	Current practice: reporting to AMK is postponed	
N: I Ph: -	0-4: I 4-19: -	Use of mental notes when risk factors appear	Tool could take over warning based on risk factors
N: I Ph: III	0-4: III 4-19: I	Moment of registration: after contact moment	Tool shouldn't assume use during contact moment
N: I Ph: I	0-4: I 4-19: I	Observation of parent and child judged important	CHP wants to observe, so attention to application expected to be limited

Moreover, whereas the child abuse experts mentioned their role was throughout the protocol trajectory, two participants thought child abuse experts were only for the final stages or hardest cases. Cases of suspected child abuse annually varied between 'rarely' to 'about 15-20 times a year'. Trajectories of cases tended to be very long, because the reporting to the AMK was postponed. If it came to reporting, this happened at a very late stage (2x). One nurse mentioned she'd rather keep in control of help herself, as the AMK didn't know the situation as well as she did.

Work practices differed between the sub-categories of participants. Nurses mentioned often using house visits (3x), instead of inviting parents to the GGD-location. Nurses also mentioned the importance of using their network to communicate with other professionals (3x). Only 0-4 participants stressed the importance of building a trustful relation with the parents (3x). The sole 4-19 nurse mentioned an extensive use of care advice teams (viz.: ZAT's), which are multidisciplinary teams (e.g. schools and police) who pool their observances in order to get a clearer picture of the situation.

It was often reported that registration in the electronic medical record took place after the contact moment (4x). Part of this was due to nurses not concurrently registering during house visits. Furthermore, CHPs may want to observe the parent-child interaction during consults, instead of registering (2x)

2.6.2 Current problems with the guideline

One unexpected problem, which was mentioned only by physicians (3x), concerned the name. Registering under the header of child abuse was deemed problematic. This was first of all due negative connotations associated with the term child abuse. Physicians rather talked about having concerns about the child's wellbeing. Furthermore it was noted there was not a clear cut-off for child abuse, but rather a trajectory from worrisome situation to suspicions of abuse. According to these physicians, the term 'worrisome situation' didn't solve this problem. It is broader in meaning and therefore encompasses situations that are worrisome, but not indicative of child abuse.

Table 3. Attributes and Technical requirements of Current Experienced Problems

Number and type of CHP expressing attribute		Attribute	Technical Requirement (whenever possible)
N: II Ph: -	0-4: II 4-19: -	Protocol unsuited for difference of each situation	Specific situation may be too precise for recommendations by the tool
N: - Ph: III	0-4: II 4-19: I	Name-issue: suspected child abuse	Rename Child abuse to [increased] threat of child abuse
N: I	0-4: III	Problem: time-span seen as	

Ph: II	4-19: -	unrealistically short	
N: III Ph: -	0-4: III 4-19: -	Documentation database tends to be judged negatively	Tool may provide shortcut to relevant documentation
N: I Ph: -	0-4: I 4-19: -	Registration program judged fine	
N: - Ph: II N: - Ph: II	0-4: I 4-19: I 0-4: II 4-19: -	Registration program judged negatively Registration program judged time-intensive	
N: - Ph: I	0-4: I 4-19: -	Problem: protocol doesn't take earlier signals into account	Tool should provide overview of previous trajectories
N: - Ph: II	0-4: I 4-19: I	Problem registration: lacks surveyability in case of extensive trajectory Proposal: periodic summaries	Tool could allow archiving a trajectory, whereby a small conclusion is written Tool should allow ample space for writing summaries
N: II Ph: II S: II	0-4: III 4-19: I	Proposal: Suggestion to use protocol	Tool should make the suggestion to use protocol
N: I Ph: IIII	0-4: IIII 4-19: I	Proposal: Implementation of Balance Model	Tool should implement Balance Model
N: - Ph: III S: I	0-4: II 4-19: I	Proposal: Implementation of Roadmap	Tool should implement roadmap of the guideline
N: II Ph: -	0-4: I 4-19: I	Roadmap of protocol deemed fine	
N: I Ph: I	0-4: I 4-19: I	Proposal: checklist concerning other professionals, and signals.	Tool should include a list of all signals and other multidisciplinary professionals
N: - Ph: I	0-4: I 4-19: -	Proposal: Using Open Fields	Tool should have enough open fields to notate information
N: - Ph: I	0-4: - 4-19: I	Proposal: reminder to check earlier suspicion	Tool should notify used when suspicions were reported at an earlier stage
N: - Ph: I	0-4: - 4-19: I	Proposal: suggestion at conclusion	Tool should suggest next step at each notated conclusion
N: - Ph: I	0-4: - 4-19: I	Proposal: Add 'Child in danger?'-question	Tool should ask whether the child is in danger
N: - Ph: II	0-4: - 4-19: II	Proposal: information option	Tool should have option to obtain more information

Secondly, the guideline itself caused problems. Two nurses considered the guideline too rigid for the nuances of each case. Furthermore, the advertised time-span of the protocol was seen as unrealistic by 0-4 workers.

Judgments concerning the programs for registration (viz.: mlCAS) and database for documents (viz.: MAVIM) varied widely. Both were called time-consuming and impractical, but also absolutely fine. A shortcut to the documentation (1x), signal lists (2x) and a help-option (2x) were proposed.

Other popular proposals were notifications by the tool when to start the guideline (4x). Furthermore it was often proposed by physicians to embed components of the guideline such as the Balance Model (5x) and the roadmap (3x). Several proposals were only made by single end-users. These proposals include a recurring option asking the CHP whether the child is in danger; an overview of previous trajectories per child; having enough open fields available for notation; a reminder to check on an earlier notated suspicion; and the suggestion whenever a conclusion has been made to continue with the next step.

2.6.3 Needs and Barriers to the Innovation

A much reported need was the necessity that the tool should be clear at a glance (4x). Furthermore its information should be unambiguous (2x) and texts should be short (1x). The tool should be compatible with the current registration program. Furthermore it was asked several times (3x) that the tool should ask the CHP whether permission by the parents has been obtained to gather information among third parties. Also physicians considered it necessary that the judgment on the child risk at the balance model should be left to the CHP.

A primary barrier was a lack of time for the tool (4x). Moreover it was often mentioned (5x) that the tool should be subtle in the naming of child abuse due to openness to parents. As one Physician put it “it should be inconspicuous, but not too much”. Other identified barriers were a low usability (2x) and an excessive amount of pop-up’s (1x).

Table 3. Attributes and Technical requirements of Current Experienced Problems

Number and type of CHP expressing attribute		Attribute	Technical Requirement (whenever possible)
N: I Ph: -	0-4: I 4-19: -	Need: Texts should be short	Texts should be short
N: I Ph: II	0-4: III 4-19: -	Need: Parents permission is needed for extern information sharing	The tool should ask whether parents have given their permission to share information

N: I Ph: III	0-4: III 4-19: I	Need: Clarity at a glance	Tool should be clear at a glance
N: - Ph: II	0-4: I 4-19: I	Need: Unambiguous	Tool should be unambiguous
N: - Ph: III	0-4: III 4-19: -	Need: Judgment Balance Model rests with CHP	Judgment Balance Model rests with CHP
N: Ph: S: II	0-4: 4-19:	Need: Compatibility	Tool has to be compatible with registration program
N: - Ph: II	0-4: I 4-19: I	Barrier: low usability	Tool should have a high usability
N: II Ph: III	0-4: IIII 4-19: I	Barrier: Openness to parents	Tool should be subtle regarding naming/framing of child abuse and neglect.
N: - Ph: IIII S: I	0-4: II 4-19: II	Barrier: Time	
N: - Ph: I	0-4: - 4-19: I	Barrier: Too many pop-up's	Tool shouldn't use pop-up's too often

3. Interview Series 2

3.1 Developing Initial Prototypes

Based on the first series of interviews and the various components of the literature search – it is now possible to merge both approaches into prototypes.

The ultimate aim of this research is not merely supporting CHPs – but to stop and prevent child abuse. Supporting the professional is therefore a means to this end, rather than the end itself. This priority of goals was kept in mind regarding decisions for the applications design. There appeared to be several issues that have a direct influence on late or non-signaling of child abuse.

First of all, the first interview series indicated that the recommended time-span was not always adhered to. Participants reported that a) the trajectory from 'worrisome situation' to 'child abuse' could take a substantial amount of time, b) the recommended time-span was unrealistically short, and c) it took too long before the AMK was contacted. Although child abuse experts ought to help CHPs with cases of suspected child abuse, both CHPs and child abuse experts reported this was still forgotten often.

Furthermore, the first series of interviews resulted in many proposals to embed key-elements of the guideline into an innovation. Chief among these proposed elements were the Balance Model and the Roadmap of the protocol.

Because these issues permeated the whole of the protocol, the decision was taken to make a single application to support the whole trajectory from the first signals to (for instance) the reporting to the AMK. Different main menus were made, based on the protocol, the reporting code and a combination of both. Moreover menus were made for each sub-step.

As a lack of time was known from literature and interviews to be a recurring problem, the application should ideally communicate with the current registration program. This would preclude having to register similar things in separate places. This should also increase the applications operability with the current registration process.

As ease of use and visually attractiveness were mentioned several times in literature – as well as several times in the interviews with end-users, great care was undertaken to give the application a clean look. Options were added to write brief summaries, as well as standard option in each screen to obtain more information about the step. As child abuse experts were reported to be little used, although these could help out with all steps, options to contact child abuse experts were added to all appropriate steps. Furthermore, to prevent too much time spent in the trajectory, a small field was

added at the top of each screen indicating the number of days that the trajectory was already running for the specific child. This should ensure the CHPs are at least aware for how long the trajectory already runs. To offer more clarity concerning the nature and seriousness of child abuse (step 4 in the reporting code), a special screen was made for the Balance Model. This consisted of scales, on which small blocks appeared when risk- of protective factors were added.

As the roadmap was proposed by several CHPs, and interactive main menu was made for the roadmap. Clicking on steps would open up options as well as information related to that step. Another main menu was designed based on the five steps of the reporting code. A third main menu was made as combination of both the guideline and the reporting code. This combination menu consisted of the five reporting code steps which were rendered in flow-chart form, comparable to the roadmap.

Problems with the integration into current working practices as well as decreased doctor-patient relationship were often mentioned in literature. As participants in the first series of interviews mentioned registration tended to take place after contact moments – it seems that the new application can be used at the same moment. This should prevent problems for either potential barrier. The application was given an inconspicuous name 'In case of Increased Risk Neglect and Child Abuse'. This name would be more subtle than simply 'Child Abuse', but not as ambiguous as 'worrisome situation'.

3.2 Participants

The participants who had agreed to partake for the first interview were approached for the second interview. One user, a physician for the ages 0 – 4, found it impossible to schedule a second interview and dropped out. This left 8 participants. Because the second series of interviews would be mainly about functionality and lay-out aspects, the opinion of end-users was most important. Therefore no stakeholders were interviewed at this stage.

3.3 Procedure

Interviews were held from March 2013 until May 2013. The interviews took place at a time and place of the participants choosing. All interviews took roughly one hour. They were tape-recorded, with the interviewer making additional notes. Participants were given the prototypes on paper and were allowed to write and draw on the prototypes to explain their thoughts better.

Interviews started with a short introduction regarding the studies goals and general information such as that the interview would be taped and processed anonymously. Participants were able to ask for further clarifications at this stage. Then the interview continued with the three main menus. Participants were asked to speak their mind and encouraged to choose the best of the three possible main menus. This was followed by the sub-menus, whereby it was made clear the sub-menus were not mutually exclusive so that no choice had to be made between them.

3.4 Analysis

All taped interviews were transcribed by the interviewer. Furthermore all participants were anonymized using a code that included their profession, age-group tended to, and a number to identify them within the category. The smallest possible unit coded was a word; the largest possible unit coded was a paragraph. The order of analysis was interview after interview (rather than equivalent questions between interviews).

All potentially relevant user expressions were distilled from the interviews. These were paraphrased into a more general form, after which the essential part of the paraphrase was notated as attribute. Different user-expressions were sorted based on attribute categories, so to make it possible to see which expressions were said most often.

3.5 Results

3.5.1 Main Menu 1: Reporting Code

The Main Menu based on the Reporting code domestic violence and child abuse (henceforth: MM-R; see figure 1) was generally deemed clear (5x). A major and recurring perceived problem (6x) was the absence of a final step in the trajectory of prevention of child abuse. It was proposed to extend the current five steps of the Reporting code with a sixth step for 'follow-up and evaluation'.

The order of the Reporting Code's steps wasn't the most logical one according to several participants (3x). Nevertheless, these 3 participants disagreed with each other what the correct order should be. The numbers in front of each step, signifying a fixed order the steps should be undertaken in, were deemed to improve clarity though (2x).

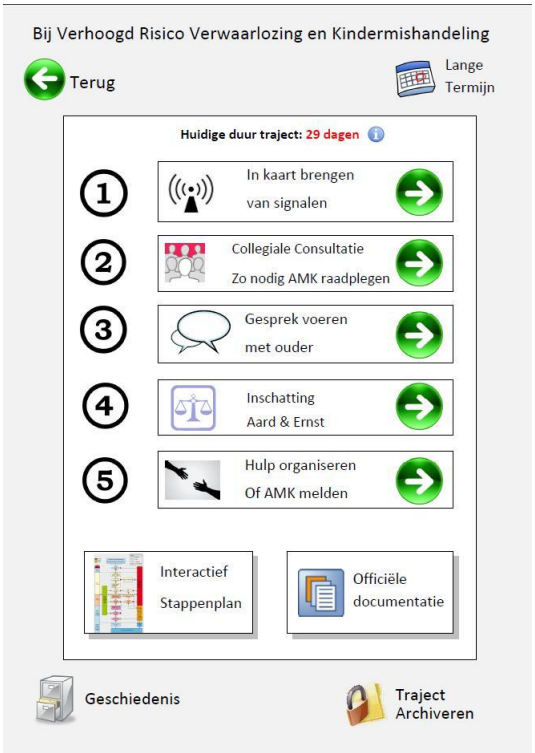

Figure 1: Main Menu: Reporting Code

Additionally one participant recommended an extra step, between #2 and #3, where the CHP would make a Decision regarding which steps are to be undertaken. Another participant rather wanted a step for gathering information at third parties.

Information options or fields, akin to the H-R menu, were proposed – with another one suggesting a full manual regarding the use of the application. Additional information regarding the guideline, as exemplified using a button called Official Documentation, was deemed favorably (3x). It was suggested to make clear which steps had been undertaken, for instance by making the steps green.

3.5.2 Main Menu 2: Guideline

A major difference of the so-called Richtlijn version (henceforth MM-G, see Figure 3) with the MM-R is that the former has a time-line participants are encouraged to adhere to. This proved a controversial subject in this menu, with 2 participants clearly opposing the time-line, and two others advocating it.

Although the separate information field was greeted positively (3x) – the menu itself met with generally unfavorable views. It was seen as unclear (3x) and unsupportive (2x) – compared to a single positive opinion. Its main strength was that it adhered to how current practice should be – given that current practice ought to be the Protocol.

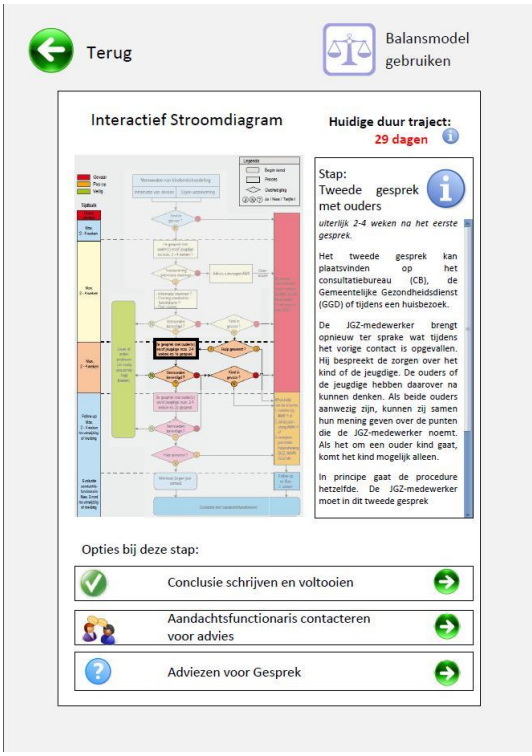

Figure 3: Main Menu: Guideline

3.5.3 Main Menu 3: Combination

The final proposed menu (henceforth MM-C, see Figure 4) was a combination of both the guideline and reporting code. This option was viewed as clear (3x) and positive (2x), and two interviewees found the offered maneuverability by the diagram positive. A key problem here was that CHPs may end up going around in the circle of step 2-4, thereby reaching a conclusion at a very late stage. One participant missed the central role of the Child Abuse Expert in the diagram.

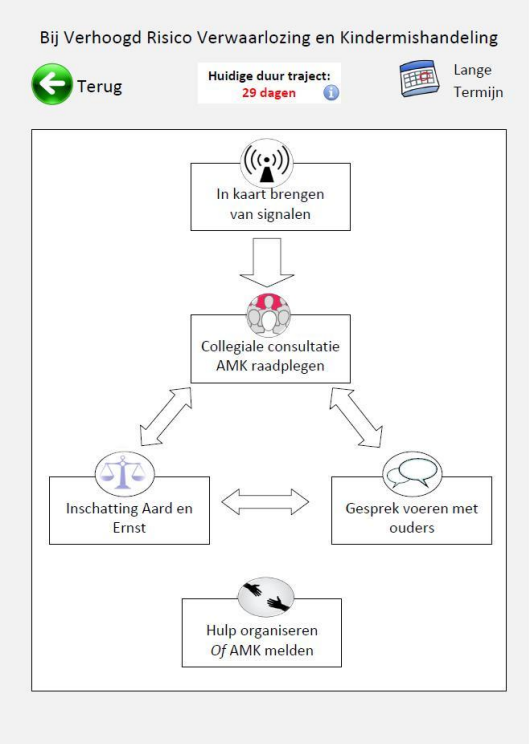

Figure 4: Main Menu: Combination

3.5.4 Comparing the three Main Menus

A comparison of main menus gave reasonably mixed results. MM-R was generally found to be clearest (4x) and best (4x). MM-C was named once clearest, and once to be the best option. Positive points were mentioned about the MM-G, such as that it was most according to current practice (1x) and had a

clear place for the road-map (1x). On the other hand, it was never explicitly mentioned as best among the three options.

3.5.5 Sub-Menu 1: Registration of signals

The first sub-menu (Sub-menu #1: Registration of Signals; figure 5) concerned the registration of signals. This menu was often mentioned to be fine (6x), as well as clear (4x) and offering insight (1x). Still, there were some minor problems. One participant proposed to change the name of a category [signals of violence]. Another wanted to be able to visually register the places of bruises on a child; and yet another thought the speech balloons (indicating an option to add further explanation) was not in the style of the registration program. A possible problem that was remarked upon was that filling in the form might (seem to) take too much time (1x).

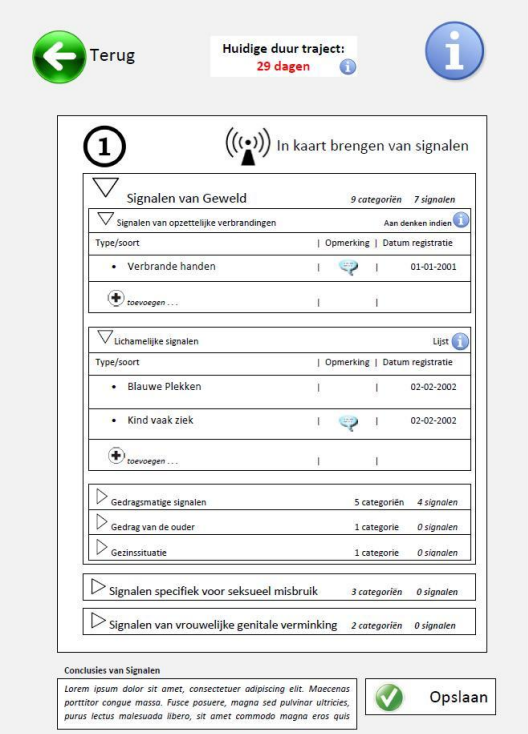

Figure 5: #1: Registration of Signals

3.5.6 Sub-menu 2: Consulting peers

Sub-Menu #2 (figure 6), concerned with the consultation of peers, was perceived as fine (5x), clear (4x) and useful (3x). Five participants spoke about which third party professionals they often spoke with to gather more information. This turned out to be a wide variety. Instead, the answers for most often used professionals were similar. Education (school for 4-19 participants; kindergarten for 0-4 participants) was mentioned often, as well as child care by the professionals for the ages 0-4.

Opinions were divided concerning the use of the General Practitioner for obtaining addition information. Three interviewees told GPs were often

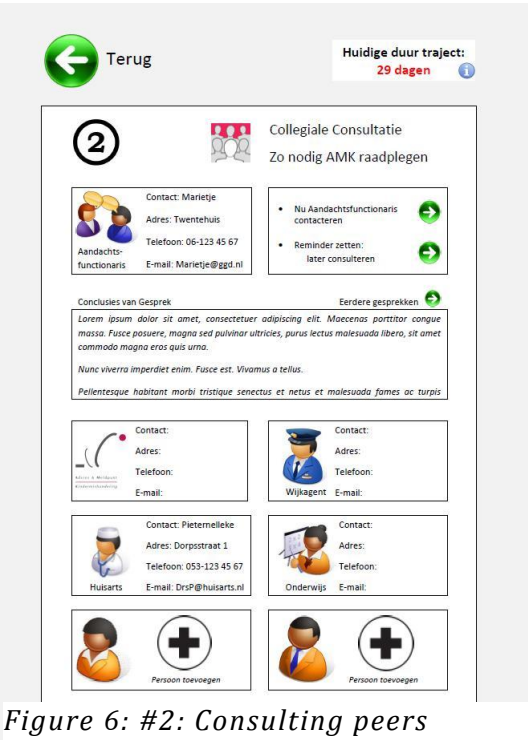

Figure 6: #2: Consulting peers

used, while two other participants mentioned they hardly spoke with them at all. Further suggestions for professionals most used for additional information included an educational functionary (1x), and members of another team in the organization (1x). Similarly it was suggested to have an option to register larger meetings (MDOs) instead of only conversations with a single other professional. Because of the variety in which professionals were used most often, one participant suggsted to limit the standard filled-in professionals and have more space to add new ones instead.

Having the contacts merely as 'business card', thus without additional options, was perceived as sufficient by all participants mentioning the subject. A shortcut to sending contacts an email was mentioned to be possibly handy. A possible problem that was uncovered (2x) was that it has to be clear that permission has to have been gotten from parents to talk with other professionals. Moreover, it was proposed (2x) to have separate conclusions per conversation, instead of one big text-field. Finally, one participant proposed to have a fairly active reminder system that inhibited the CHP to go to step 3, if the child abuse expert and AMK have not been contacted in step-2.

3.5.7 Sub-menu 3: Conversation with parents

The third menu (figure 7) concerned the conversation with parents was generally deemed fine (3x) and clear (4x). One interviewee commented that the aspects of Documentation and Advices had only limited use, as the CHPs shouldn't need them by virtue of their experience. No major problems were expected – only two minor changes in wording.

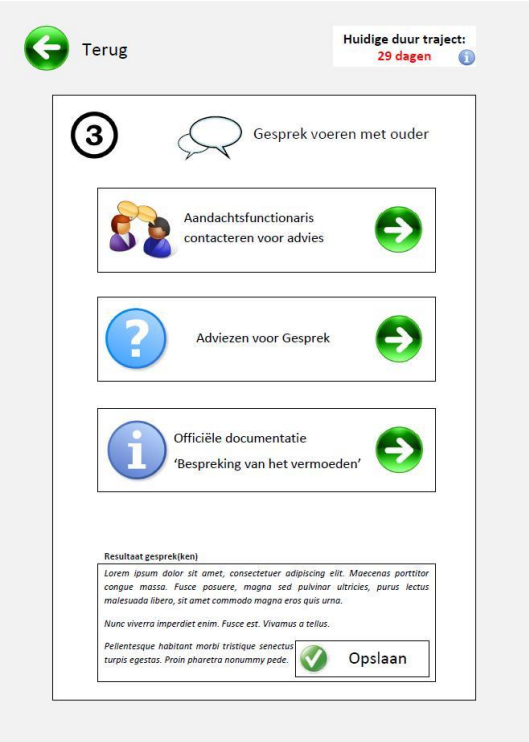

Figure 7: #3: Conversation with parents

3.5.8 Sub-menu 4: Nature and Severity of child abuse

Menu-#4 (figure 8) was by some found to be fine (2x) and clear (2x). An option was given to use Risk Taxation Instruments (RTIs) to more objectively tax the risk a specific child has on child abuse. This was positively received (4x) (compared to 1 person who mentioned not to miss them at this moment). It was noted CHPs might need further schooling for this. Two participants noted it could be a good idea to fill the RTI out alongside a child abuse expert or different colleague.

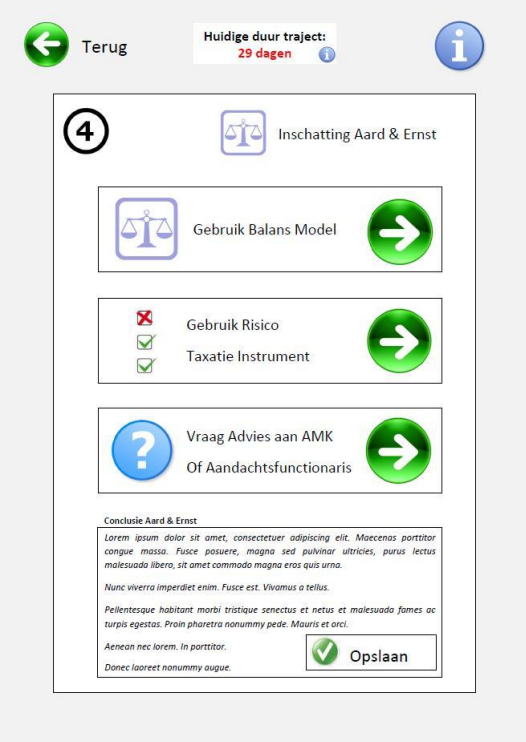

Figure 8: #4: Nature and severity of child abuse

3.5.9 Sub-menu 4: Balance Model

The integration of the Balance Model (BM; figure 9) was received well. It was generally found to be fine (5x), useful (4x), clear (3x) and visually pleasing (1x). Interviewees agreed that the weight of factors differ – so the conclusion concerning the models balance should be left to the professional (3x). Comments were made that some factors may need tweaking – as not all factors were deemed to be useful (2x). Furthermore, a participant remarked that it should be possible to remove a factor.

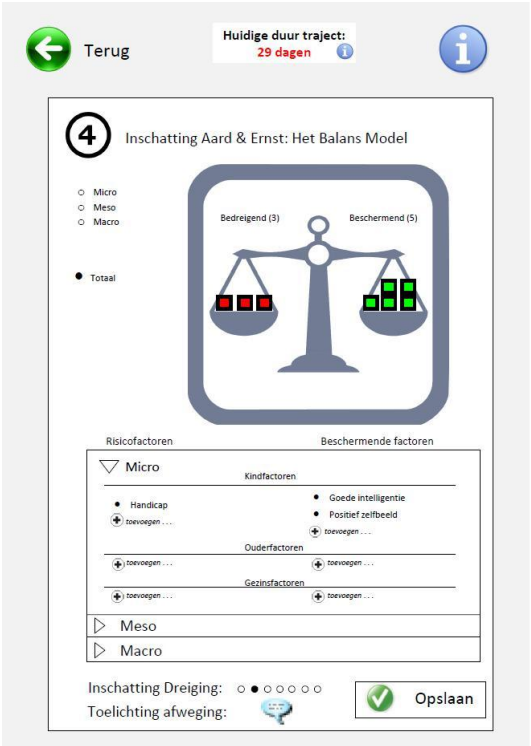

Figure 9: #4: Balance Model

3.5.10 Sub-menu 5: Organizing help & reported to the AMK

It was proposed several times (3x) that a system akin to menu-#2 (consulting peers; figure 10) could be useful to list the different organizations that can be referred to in step 5a (Organizing help). One participant mentioned such a 'social map' already exists as mobile phone application.

For step 5b (reporting to The AMK), it was deemed enough to offer some information about what type of information the AMK desires, as well as the standard-form that is used for this communication (1x).

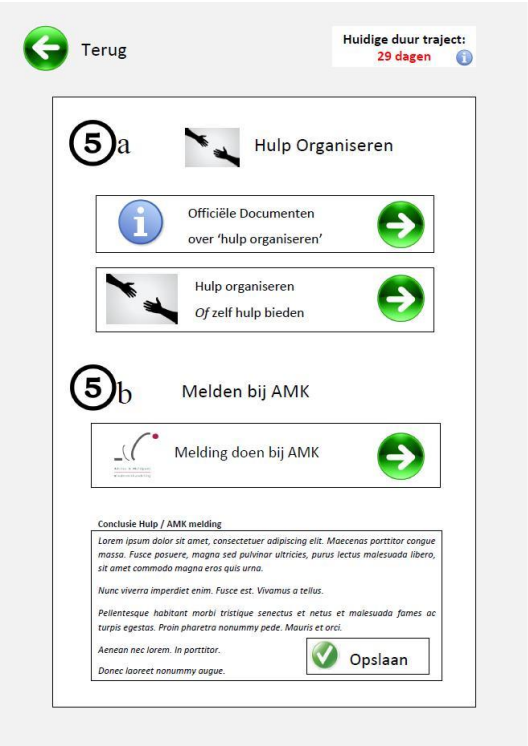

Figure 10: #5: Organizing help & reported to the AMK

3.5.11 Miscellaneous Results

The overall impression of the whole application was positive (7x). There was no consensus concerning the ideal name for the whole of the application. The name of the application on the tested prototypes was 'In case of Increased Risk Neglect and Child Abuse'. Two participants thought this name was okay; two other participants proposed two completely different titles. Furthermore, two participants remarked that it was unclear when a child was under increased risk – and that increased risk was something to be established during the trajectory.

The time-counter should be changed either to weeks, or a combination of weeks and days (2x). One interviewee didn't think it would have much of an effect either way. One participant thought CHPs could be supported at adhering to the time-span using reminders in CHPs' time-tables.

It was unclear when the application should be started. It was proposed (2x) to have some link with the registration program. This could either be that the program came up with the question whether the application should be started; or an option within registration program that specific signals

should be linked through to the application. Another interviewee proposed to have a sign light up to indicate that the application is active for a specific child.

One interviewee asked for an option to put documents, for instance gotten from group-meetings about specific children, in one place. In line with this was a proposal to have the medical background of the child available. Another interviewee thought a specific place to register the parents' opinion could be useful. One interviewee proposed buttons in sub-menu's to continue to the next screen. Another one proposed to have in every sub-menu a button asking whether the child is in danger. Finally, if a trajectory has been archived – one participant noted it should be explicitly unlocked by a CHP if they want to make changes.

4. Conclusions

4.1 Summary of Results First Interview Series

The first series of interviews yielded valuable information regarding the end-users point of view to the guideline and a supporting tool. Child abuse experts, who play a key role in the guideline, were often not used by CHPs. Moreover the trajectories, from first signals to action took a long time. CHPs tended to register situations for a substantial amount of time as 'worrisome situation' rather than 'suspected child abuse'; the recommended time-span was not always followed; and reporting to the AMK was occasionally postponed. This meant that trajectories of suspected child abuse take too much time. Registration often took place after the contact moment.

CHPs often asked that the components Balance Model and Roadmap of the guideline were embedded. Users remarked the application should be easy to use and unambiguous. A lack of time was often named a barrier, as well as the innovation having a conspicuous name – as parents can observe the registration process.

4.2 Conclusions of First Interview Series used for Design Prototypes

Based on the results of the first interview series initial prototypes were made (see section 3.1 for extensive information concerning the development). It was concluded that an application should be made which supported the entire process from the first signals of child abuse until the final action undertaken by the CHP. Three different main menus were made (based on the reporting code, guideline and a combination of both), as well as sub-menus for every step of the reporting code. The option to contact a child abuse expert was interwoven at every relevant step, to increase their visibility to CHPs. Furthermore, every screen contained a small time-counter showing how long the trajectory of suspected child abuse for that specific child has been running. These prototypes were shown to the users, who were asked to comment on them.

4.3 Summary of Results Second Interview Series

The main menu based on the reporting code was judged to be the best and clearest option of the three possible main menus. A major observed problem of this menu was that a final step concerning follow-up and evaluation in the trajectory lacked. Furthermore, CHPs didn't think that the order of steps of the reporting code was optimal. The main menu based on the guideline was generally seen as unclear and unsupportive. The combination main menu was judged to be positive – although a major possible problem identified was that CHPs may not reach a conclusion.

The first sub-menu concerning the registration of signals was judged to be fine and clear. The second sub-menu concerned the consultation of peers and other professionals. This sub-menu was deemed fine, clear and useful. Little consensus was found concerning which groups of professionals (e.g. GPs) were contacted most often for additional information. The third sub-menu, concerning the conversation with parents was judged fine and clear. The fourth sub-menu concerning the nature and severity of the suspected child abuse was deemed fine and clear. The option of using Risk Taxation Instruments to evaluate the risk of child abuse was received positively. The Balance Model, which was a separate sub-menu in the menu of nature and severity of child abuse, was judged fine, useful, clear and visually pleasing. Interviewers were in agreement that the decision whether model was in balance should be left to the CHP. The final sub-menu concerned the organizing of help and/or reporting to the AMK. It was suggested several times the sub-menu should contain a list of organizations that could be referred to.

Overall the prototypes were received positively. No consensus could be obtained for a different inconspicuous name.

4.4 Conclusions Second Interview Series

Given the overall impression of the application by participants was positive, only a few changes were needed for the final design. Because the Main Menu based on the Protocol was not received well, this main menu was abandoned. The Combination Main Menu was seen as less clear than the Main Menu based on the Reporting Code. Furthermore MM-C had the danger of CHPs not reaching a conclusion on what to do. Due to these reasons, only MM-R will be kept for the final design.

The main problem with MM-R was the order of the steps. Part of the confusion arose from the fact that information by other professionals, which has to be obtained in step two, is only allowed to be obtained after parents have given their consent. However, the conversation with parents is step three. For this reason step two and three have been switched around in the final design – such that the conversation with parents takes places before information can be obtained.

In screen #2 (consulting peers) the ‘options’-component for child abuse experts and the AMK was removed. In the automatically filled-in spots the police officer was removed. Furthermore a new structure for notating the results of conversations with other professionals (e.g. to obtain information) was changed. Rather than a single large field to write in, a new foldable field was made for each conversation. This would make it clearer at what time what other professional was spoken. Furthermore, when registering the contents of a new conversation, there should be an option asking

whether permission from parents has been gotten. That way the user gets reminded that permission is required in a subtle manner. Furthermore, the CHP has to deliberately register that permission has been obtained – precluding CHPs forgetting that it was necessary to obtain permission.

Although received well, the Risk Taxation Instruments of sub-menu #4 are currently not available in the organization. This option was therefore removed. In sub-menu 4-Balance Model the option to remove filled-in factors was added.

Changes in the wording of categories and options took place at various screens (MM-R; #1; #3). The time-counter was changed from showing the duration of the trajectory in days, to a combination of weeks and days.

See for the final prototypes Appendix 3.

5. Discussion

This study aimed to design an application in the Electronic Medical Record to support Dutch Child Health Professionals (CHPs) using the protocol for Secondary Prevention of Child Abuse. The process leading up to the final design of this application consisted of an interview with end-users regarding their needs and wishes; and an interview with end-users concerning proposed prototypes. The result of this process was a prototype that could be further developed by software developers.

5.1 Answering Research Questions

5.1.1 Research Question 1: What problems do Dutch Child Healthcare Professionals encounter when using the guideline Secondary Prevention Child Abuse?

In order for the tool to be relevant for the end-users, current problems with the guideline were identified. Unexpectedly, several physicians reported problems with the name of child abuse. The physicians considered that there was no clear cut-off point between worrisome situation and suspected child abuse – and hence no clear point when to start the guideline. Moreover the guideline caused problems because participants found it too rigid for the variability of specific cases. Furthermore the time-span that the guideline recommends was seen as unrealistic by 0-4 participants. Moreover participants considered that the duration of the time-span was relative to the severity of the situation.

Problems were reported by participants with using two components of the guideline, the Balance Model and the Roadmap. Participants proposed supporting their use by embedding them in the tool. Other problems related to the programs used for registration of electronic medical records, and the database for documents. Both were called time-consuming and impractical – but fine by others.

For the initial prototypes, the innovations name was ‘In case of Increased Risk Neglect and Child Abuse’. This was expected to decrease the step from worrisome situation to suspected child abuse. This new name caused questions among physicians who argued increased risk was something to be established during the trajectory, rather than at the start. Although the implemented Balance Model was received very well, a main menu based on the roadmap was surprisingly seen as worst of three possible main menus. The guideline main menu was seen as unclear and not supportive.

The generic problems were expected given previous literature on barriers to guidelines. Quaglini (2008) has previously identified the problem that physicians may deem guidelines too rigid for specific cases. A lack of self-efficacy to adherence to the time-span was reported at the test-implementation of the guideline (Broerse et al., 2009). Moreover participants disagreed with having

a fixed time-span; lack of agreement with guidelines is also often seen as barrier to guideline adherence (e.g. Cabana et al., 1999). Reported problems with the registration program were to be expected, both the perceptions of the registration's time-consuming nature and impracticality were reported numerous times in electronic medical record literature (e.g. Rose et al., 2005; Boonstra & Broekhuis, 2010).

On the other hand, no previous literature has been found concerning barriers to the name (in this case 'child abuse'). Furthermore no previous cases of lack of clarity when to start following the guideline have been found. Presumably the reason for this is that the guideline starts at the point where the CHP gets a suspicion of child abuse. This is not a well-defined point, but rather an accumulation of worries concerning the child's situation. For this reason, the name of the initial prototypes included that the tool should be used in case of increased risk of child abuse.

5.1.2 Research Question 2: What are the current work practices of Child Healthcare Professionals for cases of suspected Child Abuse?

The guideline was not part of current work practices for some participants. Reasons given were lack of familiarity and lack of added value. Moreover child abuse experts, who are a key component in the guideline, were often not consulted. Furthermore trajectories of suspected child abuse took longer than necessary because reporting to the AMK was postponed.

Work practices differed between the sub-categories of participants. Nurses often had contact moments at the parents' home and commented on the importance of building a trustful relationship with parents and communicating with other professionals. Registering in the electronic medical record tended to take place after the contact moment. Nurses did not register whilst visiting a parent's home. Furthermore CHPs reported to prefer observing the parent-child interaction rather than register.

As the innovation supports the CHP in all steps that should be taken, the problem of lack of familiarity should be decreased. Recurring options for child abuse experts were added to make the experts more visible to CHPs and were generally received favourably.

Differences in work-practices between participant-categories had been expected, and were the reason for making participant-categories in the first place. The low use of child abuse experts had been expected, as these results had previously been reported by an evaluation of the guideline (Broerse et al., 2012). Non-use of the guideline has been extensively researched (see section 1.2.1.1).

The reported reasons for non-use, lack of familiarity and added value, have been reported in previous literature several times as well (e.g. Cabana et al., 1999).

Registration after contact moments had been expected. Even though the registration is compulsory, CHPs tend to judge that they haven't got the time for this during contact moments (Kortteisto et al., 2012). Moreover, registration during contact moments decreased the CHPs ability to observe and interact with the child and parents, which has previously been identified as a barrier to electronic medical registration (Rose et al., 2005).

5.1.3 Research Question 3: What are the needs & barriers of Dutch Child Healthcare Professionals for a guideline adherence improving innovation?

According to the needs that were reported by the participants, the tool should be clear at a glance. Furthermore texts should be short and contain unambiguous information. The tool should be compatible with currently used programs. Furthermore, it should ask CHPs whether permission by parents has been obtained for gathering additional information among third parties. The judgment of child risk at the balance model should be left to the CHP.

Two barriers were mentioned often, a lack of time for the tool and a conspicuous name. Other identified barriers were a low usability and an excessive amount of pop-ups.

The prototypes of the innovation were indeed judged to be clear and overall fine. The prototypes intended to show compatibility with the current registration system, which was judged very useful. The balance of the balance model depended on the CHP as requested and was received well. A completely inconspicuous name could not be found without the danger of ambiguity – other name-options reached no consensus among participants.

The reported needs have all been found in previous literature. Clarity and attractiveness of the interface have been reported often (e.g. Brouwer, 2011; Michel-Verkerke & Spil, 2013). Moreover having little information on the screen at any one time was previously reported to decrease user dropout attrition (Hauser et al., 2009). Furthermore, the compatibility of the tool with current programs has been reported several times as being an important factor for the adoption of new innovations (e.g. Rogers, 2003; Michel-Verkerke & Spil, 2013).

A lack of time for new innovation has often been reported as a primary barrier for the adoption of, and adherence to, innovations (e.g. Michel-Verkerke & Spil, 2013; Kortteisto et al., 2012). The barrier of having a conspicuous name of the innovation has not been reported previously. The reason given

for this barrier by participants is that parents are able to look on during registration. The tool therefore needed a more subtle name than 'Child abuse' which would scare away parents according to participants.

5.1.4 Research Question 4: What are the needs and wishes of relevant stakeholders for a guideline adherence improving innovation?

Only a few meaningful units were extracted from interviews with stakeholders. The reason for this was that stakeholders generally had few wishes and demands. They were therefore analyzed alongside users.

It's interesting that stakeholders proved to be of limited use, given that stakeholders take a central place in literature (e.g. Mitchell, Agle and Wood, 1997). Moreover the importance of stakeholders has recently been advocated in health research (Hyder et al., 2009), and stakeholders take an important and recurring role in a recent approach for developing eHealth innovations (Van Velsen, Wentzel, Van Gemert-Pijnen, in press).

Perhaps initially incorrect stakeholders have been identified. It's also possible that the interview scheme was not appropriate to elicit stakeholders' needs and wishes; or that interviews were held or analyzed incorrectly. Interviews by end-users and stakeholders were held and analyzed by the same interviewer though.

It should be noted that fairly few stakeholders were identified. Normally the software developers would be important stakeholders. In this case, these developers were students who joined the project after the design had been finished. They therefore had no role in the design of the innovation and were not identified as stakeholders. Moreover, in a standard innovation one stakeholder pays for the innovation, and therefore has a say in the development. Given that the current research was a master thesis; this stakeholder was absent as well. This irregular innovation situation may explain why, contrary to recommendations in literature, stakeholders played a relatively insignificant role in the innovations development.

5.2 Strengths and Implications

This study obtained valuable insight in the process of professionals using a protocol for prevention of child abuse. Little was known about barriers to these protocols and how to potentially increase adherence. Some of these barriers, such as a lack of time, have been uncovered by means of

interviews with users of the protocol. This knowledge can act as a first stepping stone to more extensive insights into the use and disuse of protocols to prevent child abuse.

Furthermore the prototypes that were designed in this study were shown to the end-users, to comment on in a second interview. This added further insights concerning CHPs' wishes and demands for an application supporting this protocol. The application is being developed further by software developers at time of writing, and will be tested among end-users. This shall add further information concerning the effect of the application.

5.3 Limitations

Several limitations have to be remarked upon. First of all, the point that adherence to guidelines should be actively supported is still being argued over. Hawe, Shiell & Riley (2004) argue that danger lurks in seeing adherence as all-important. According to this view, the key-elements of protocols are important – but professionals get a great amount of freedom in the way they want to execute these few key-elements. Rather than adherence, proponents of this view argue that what should be measured is the extent to which the intervention's purpose, as intended by the developers, is followed (Cross and West, 2011). Skilled professionals would then understand in which situations the protocol should be neglected for optimal care. This is countered by others, who state that strict protocol adherence is absolutely necessary (cf. Spillane et al., 2007). It would indeed appear to be best to support optimal guideline adherence, as having a guideline to prevent child abuse is related with an increased undertaking of actions (such as reporting to The AMK) among professionals of up to three times (Doeven, 2008).

For the design of the application, the idea was kept in mind that the application cannot force the professional to follow the guideline – even if this were to be preferred. Whereas some components of the guideline (e.g. the time-span and the use of the child abuse expert) are heavily suggested – these can be easily ignored or circumvented by the professional. As such, the professional has substantial lee-way in adhering to the guideline. It may be that, when the fidelity versus adherence debate settles, this has been the incorrect choice.

Secondly, a bias may have been introduced during the selection of participants for interviews. As the participants were self-selected, chances for an introduced bias are inherently relatively high. For instance, it may well be possible that CHPs who already actively use the protocol will sign up to be interviewed. Or vice versa, perhaps CHPs using the protocol experience no problems and are consequently not interested in research aimed at supporting them in carrying out the protocol.

Further bias may have occurred because the organization deemed it best that recruiting went through so-called ITO's (inter team consultations). These are consultations with team-coaches for a specific area – who would then convey the question to participate to their team members. Potential participants then were to contact their team coaches, who would contact team leaders. The team leaders then decided which participants allowed to participate. In order to reduce these possible sources of bias, the sample was stratified between nurses and physicians, and between CHPs attending to age groups 0 to 4 and 4 to 19

Partially as a consequence of this, the generalizability to other situations of this study is limited. As was noted previously, the knowledge and obtained insights from one protocol may not hold for another protocol (Cabana et al., 1999). Results of this study will therefore be limited to protocols concerning the prevention of child abuse. Because there are no uniform international protocols – generalizations may only hold for the Netherlands. On the other hand, it does mean that results are generalizable to similar settings in the Netherlands – and highly generalizable to the Youth Healthcare Organization for which the innovation was designed.

Thirdly, as the interviews were only analyzed by the researcher, valid statements or views may have been missed. Conversely it is possible statements have been deemed meaningful whereas they might not have been. This extends to the design of the prototypes as well, because the results from the interviews influenced the decisions that were made concerning the prototypes (such as the menus contents). A design is inherently subjective, and prototypes were therefore checked in the second series of interviews. However, it is possible that a bias, concerning the design, has been introduced here – which is greater than it would've been with more than one analyst.

Fourthly, because the research was a master's thesis this put several constraints on the overall method. Due to this, not all recommendations for the development of eHealth technologies, as advocated by Van Gemert-Pijnen et al. (2011), could be followed. As noted previously, the software developers started their work after the second series of interviews had already been finished – rather than participate in the full process. This means that the prototypes might contain components that the software developers deem to be not feasible. Another result of this is that the advocated continuous evaluation cycles throughout the design process (Van Gemert-Pijnen et al. (2011), could not be put into practice.

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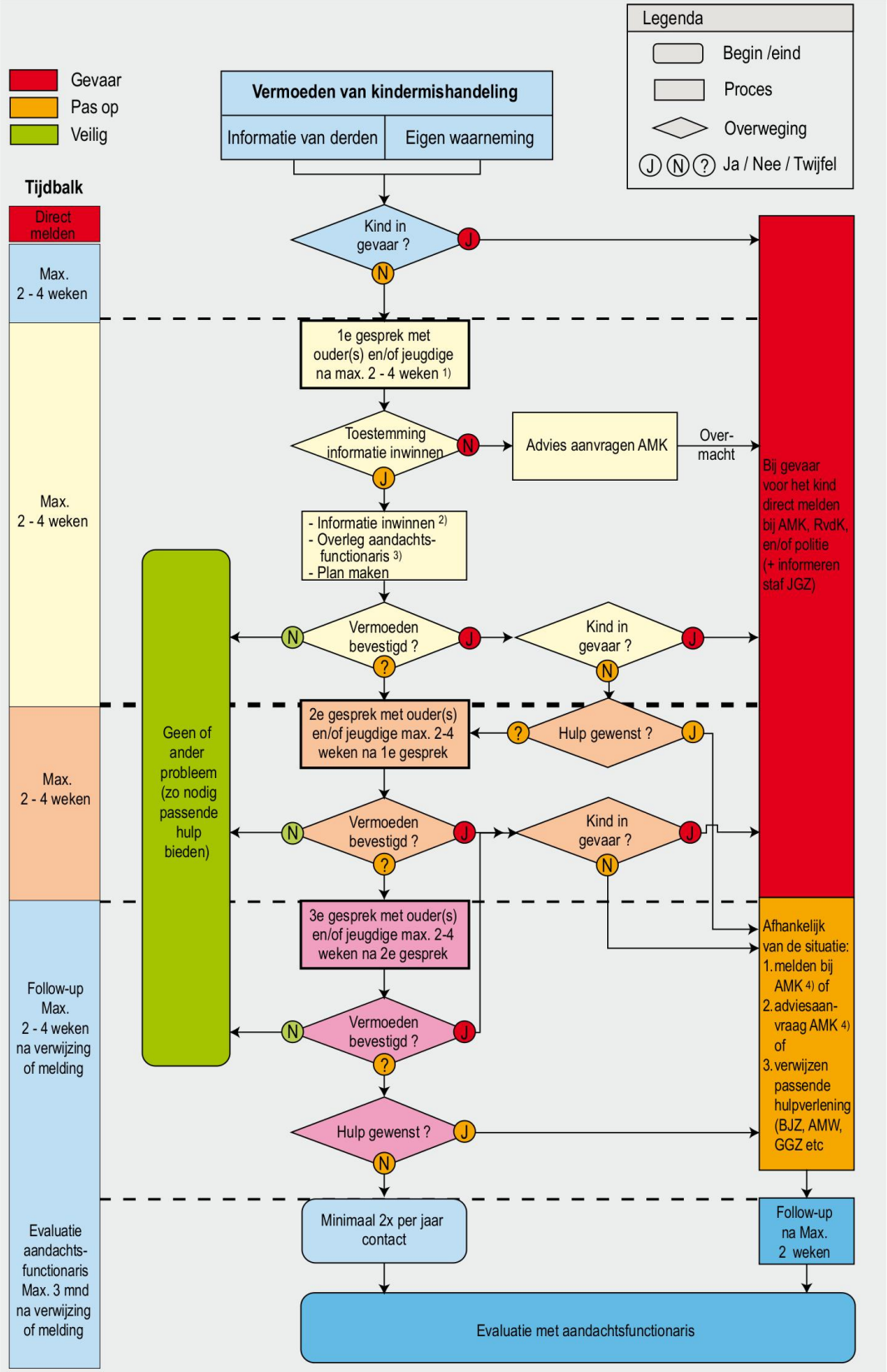
Appendix 1: Roadmap of the Guideline Secondary Prevention of Child Abuse



1) Bij vermoeden van seksueel geweld, moet overwogen worden het eerste gesprek door een deskundige te laten plaatsvinden
2) Informatie inwinnen vindt in elk geval plaats na het eerste gesprek maar kan op elk ander moment nodig zijn, evenals het aanpassen van het plan
3) Het overleg met de aandachtsfunctionaris vindt in elk geval plaats na het eerste gesprek maar kan op elk ander moment nodig zijn
4) JGZ moet ouders er op attent maken dat zij dit ook zelf kunnen doen

Appendix 2: Interview scheme of the first interview series for users and stakeholders & introduction that interviews started with.

Vragen interview voor users:

Kindermishandelingsprotocol [achterhalen hoe tegen doelen wordt aangekeken]

- **Wat** zou het doel moeten zijn?

-> In hoeverre worden deze doelen daadwerkelijk bereikt? Indien niet genoeg: hoe komt dit?

-> **hoe** kan het doel worden bereikt

Eerdere ervaring met protocol; hoe vaak gebruikt? Hoe bevalt het? [wat is de praktijk]

-Scenario laten vertellen hoe het momenteel wordt gebruikt [routine]

-> *laten opbreken in aparte taken*; e.g. 'afspraak maken aandachtsfunctionaris'

- vragen naar verschillen tussen consulten uit verschillende stadia in het protocol

-> Ideaal scenario laten schetsen obv eerder scenario & doelen. [ideeel uitgangspunt]

Huidige routine nog niet ideaal. [achterhalen doel ondersteuning]

- welk doel zou ondersteuning moeten hebben? (obv

- Hoe zou het dit kunnen bereiken?

-> Digitiaal?: Dossiers en registraties al digitaal – Hoe/wanneer wordt dat gedaan? [routine]

Enkele [eg 3] onderdelen die zo'n programma zou moeten hebben. [needs]

-> verder laten uitwerken obv huidige routine en geuitte doelen (en evt wensen).

--> Welk doel wordt hiermee hoe ondersteund?

Wanneer (bijna) niet meer gebruiken? [barriere]

Heeft u nog vragen, of zijn er wellicht dingen die u nog praktisch lijken om te behandelen?

Vragen voor stakeholders

Doel voor ontwikkeling/implementatie [achterhalen hoe tegen doelen wordt aangekeken]

- Wat is doel richtlijn (evt SMART laten formuleren)

- Wat is het doel vd stakeholder? (en wat de rol in het proces)

-> In hoeverre komen deze overeen? (i.e. is doel van stakeholder direct om doelen vd richtlijn bereiken, of zijn er andere/hogere doelen – zie ook legitimiteit)

- Wat moet programma kunnen/doen voor rol stakeholder? [needs]

-> stel dit kan niet, wat dan? [consequentie needs not met: flexibiliteit needs]

- Wat reden om steun ontwikkeling programma In te trekken? [cf. Barrieres]

- Stel er wordt niet naar u geluisterd, in hoeverre denkt u dat u de mogelijkheid hebt uw wil alsnog te krijgen? [Power, eigen & van anderen]

-> andere stakeholders zijn (...), in hoeverre bent u van mening dat zij deze mogelijkheid hebben?

- Waarom *behoort* naar uw rol als stakeholder te worden geluisterd? (Is uw claim wenselijk, fatsoenlijk, passend?; **denk ook aan eerdere al-dan-niet overeenkomst in doelen**) [legitimiteit, eigen & van anderen]

-> andere stakeholders nog steeds (...), in hoeverre bent u van mening dat hun claim wenselijk/fatsoenlijk/passend is?

- In hoeverre is een vertraging wat u betreft te accepteren? In hoeverre relatie met ontwikkeling programma belangrijk? [urgency; eigen]

Heeft u nog vragen, of zijn er wellicht dingen die u nog praktisch lijken om te behandelen?

Inleiding:

Bedankt voor het meedoen – zal eerst kort uitleggen wat en hoe.

Zoals ongetwijfeld bekend zijn er allerlei protocollen waar aan moet worden gehouden – waaronder de richtlijn secundaire preventie kindermishandeling. Implementatie hiervan werkt nog niet helemaal – zodat is besloten om een digitaal ondersteuningsinstrument te ontwikkelen.

Hierbij zijn niet alleen de designfactoren belangrijk, maar evenzo de input van gebruikers. Gaat er immers om dat het zo geschikt mogelijk is voor degenen die er mee moeten werken. Nu ben ik zelf niet de ontwikkelaar; ik kan dus geen gouden bergen gaan beloven, aangezien die mogelijk niet mogelijk zijn. Wat ik wel moet doen is een aanbeveling maken, en daarom inventariseren wat gewenst is.

Er zullen 2 interviews zijn, van ongeveer een uur. Bij de tweede zullen enkele prototypes worden voorgeschoteld. Interviews zijn **anoniem**.

Nu is er 1 traditioneel probleem bij interviews: je hoort alleen waar je naar vraagt. Daarom wil ik u op het hart drukken niet te dogmatisch aan de vraag te houden – maar voelt u vrij andere zaken aan te stippen wanneer u deze belangrijk acht voor deze inventarisatie.

Niet laten afleiden door schrijven.

Hebt u op dit moment vragen?

Appendix 3: Final Prototypes

Figure A1: Main Menu of tool based on reporting code

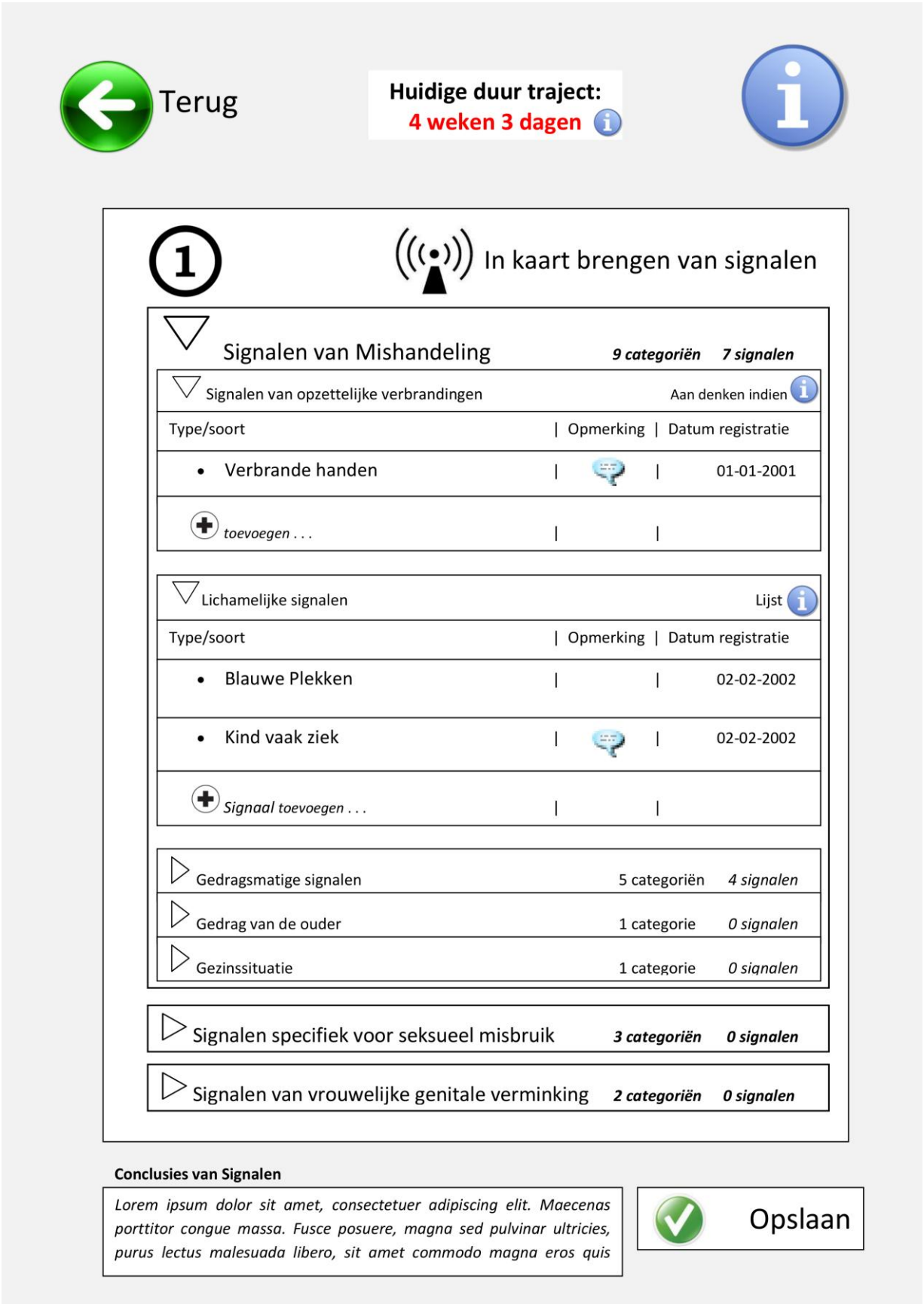


Figure A2: Sub-menu 1, registration of signals

Figure A3: Sub-menu 2, conversation with parents

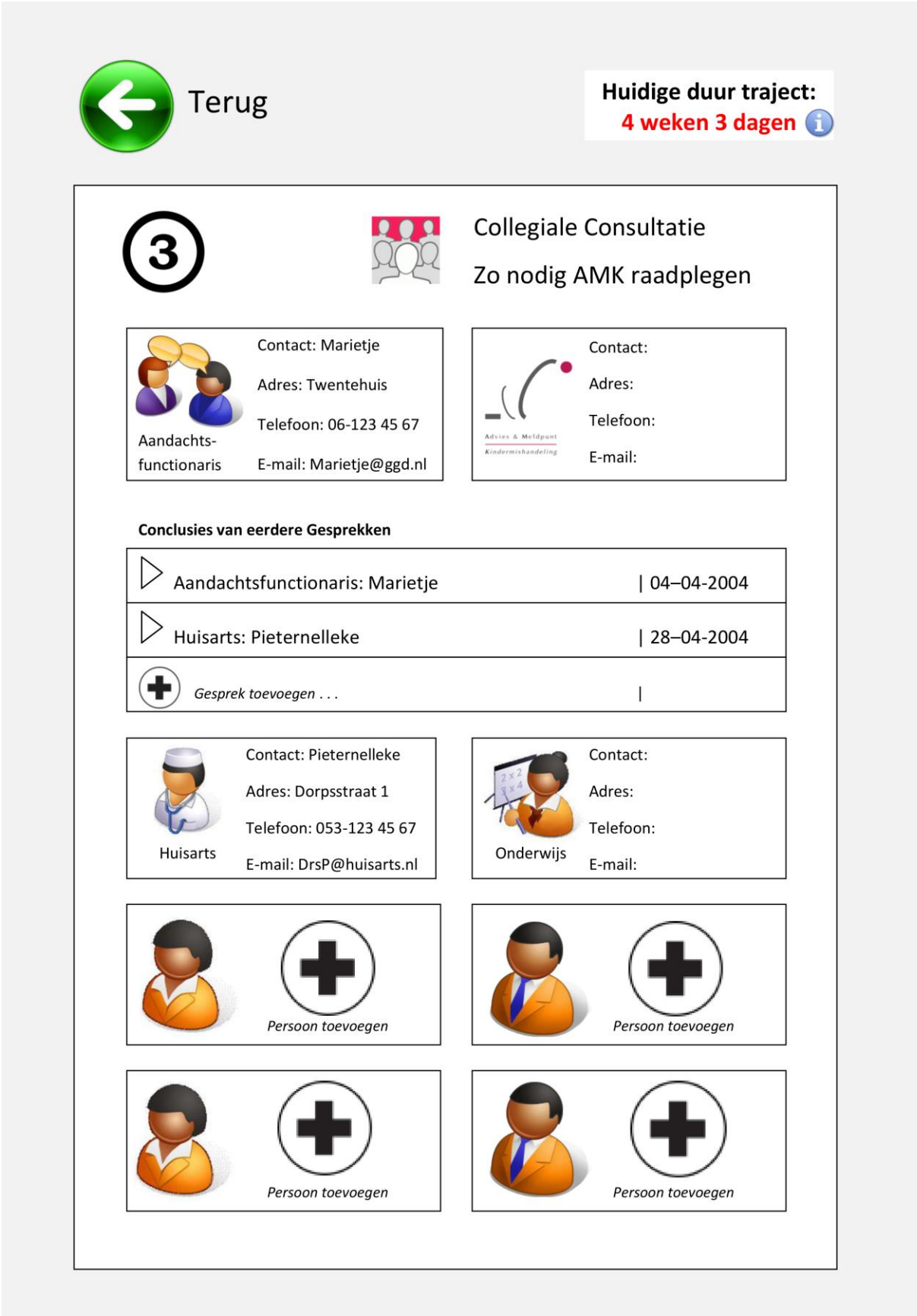


Figure A4: Sub-menu 3, consulting peers

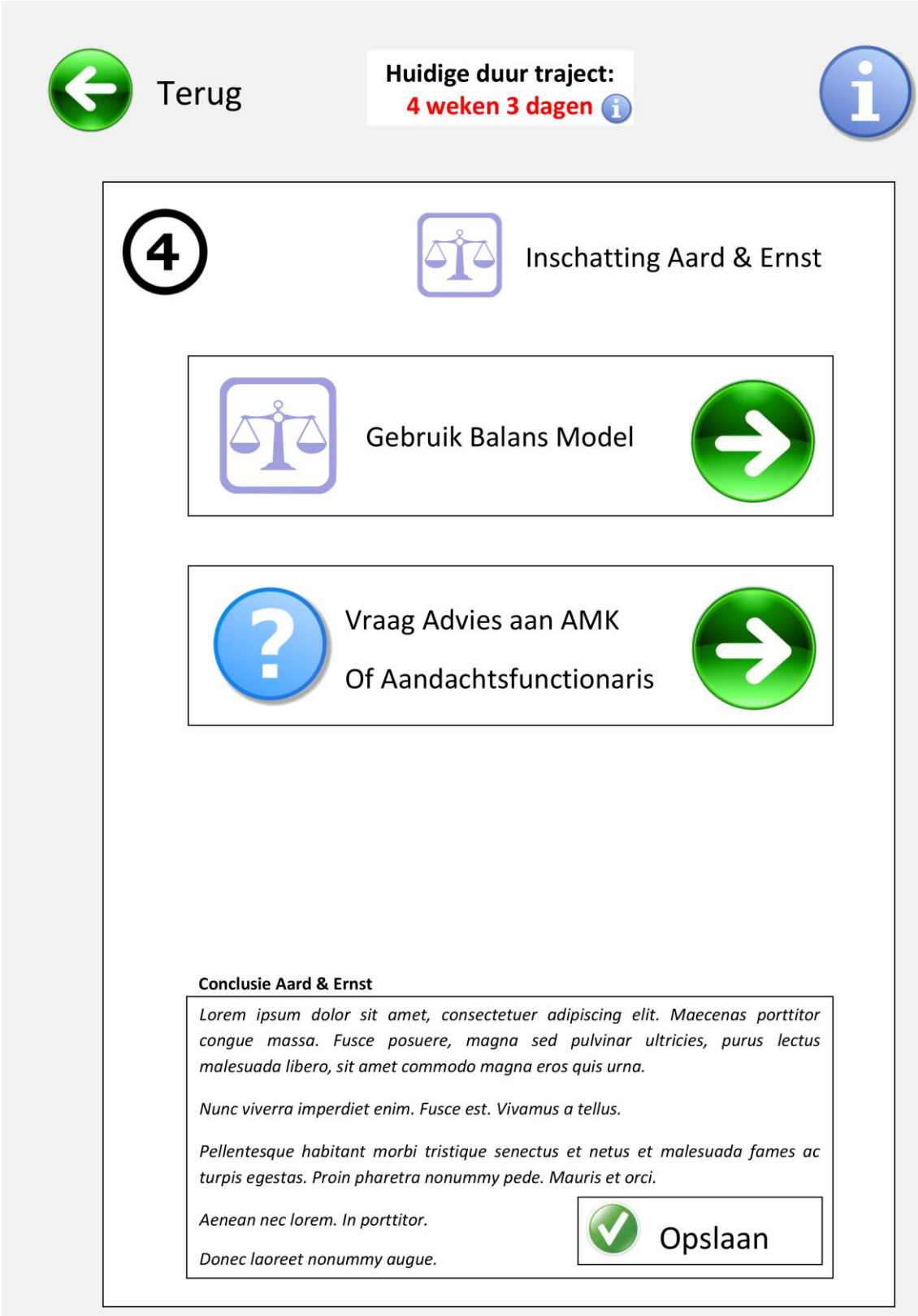


Figure A5: Nature and Severity of Child Abuse

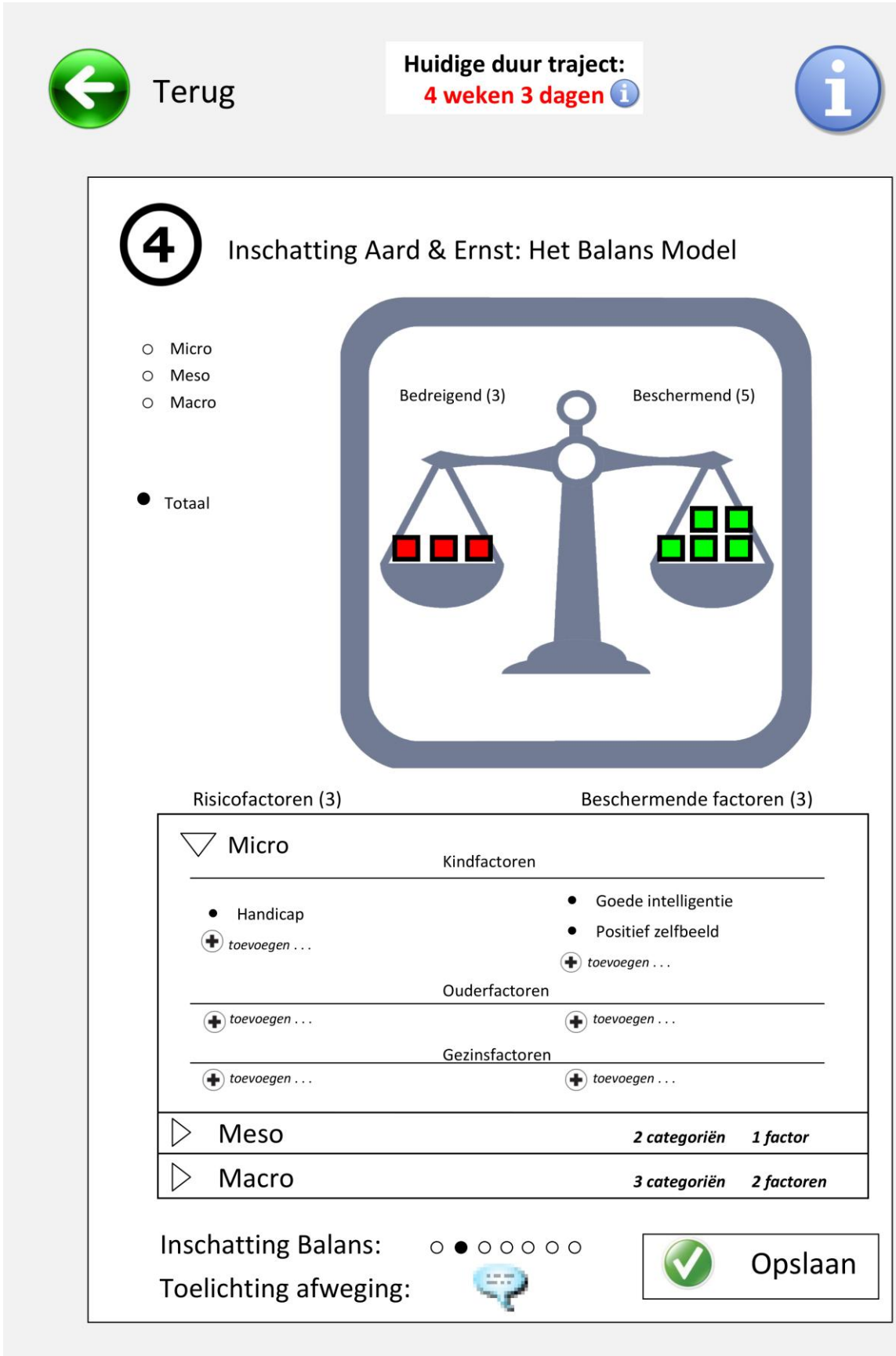


Figure A6: Balance Model

Figure A7: Organizing help and reporting to AMK