Summary

Physicians’ clinical decision-making is based on the interaction of analytical and non-analytical reasoning and gut feelings can be considered a part of the non-analytical reasoning process. The two kinds of gut feelings of general practitioners (GPs), the sense of alarm and the sense of reassurance, were described after qualitative studies in the Netherlands and in Flanders. They concern the prognosis of the patient’s state of health during the consultation. The sense of alarm means that a GP perceives an uneasy feeling as he/she is concerned about a possible adverse outcome. It implies that a GP worries about a patient’s health status, even though he/she has found no specific indications yet; it is a sense of ‘there’s something wrong here’. A ‘sense of alarm’ means that, if possible, the GP needs to initiate specific management to prevent serious health problems. The sense of reassurance means that a GP feels secure about the further management and course of a patient’s problem, even though he/she may not be certain about the diagnosis: everything fits in. The sense of reassurance and the sense of alarm constitute a dynamic element in a GP’s diagnostic process. Gut feelings have been described as a third track alongside medical decision-making and medical problem-solving and play their part in the continually interaction of non-analytical and analytical diagnostic reasoning processes. Even if an idiomatic expression does not exist in every language, the gut feelings were experienced by GPs in all European countries. In 2013 a Dutch language Gut Feelings Questionnaire (GFQ) was created from the definition criteria and validated by a construct validation procedure using case vignettes. The sense of alarm and the sense of reassurance were found as two opposites of one component explaining 70.2% of the variance after a principal component analysis. The internal consistency of the GFQ proved to be high (Cronbach’s alpha = 0.91). The kappa with quadratic weighting was substantial (0.62, 95% CI: 0.55-0.69). A linguistic validation procedure was performed to obtain an English version of the questionnaire.

This thesis was divided into two parts.

The first part aims at translating the gut feelings concept into European languages and contexts:

* What was the process for translating gut feelings into French? A Delphi procedure, with French GP experts, was used to translate “gut feelings” into the French language.
* How was the GFQ translated from English into French, German and Polish? Linguistic validation processes, following a procedural scheme, were undertaken in France, Germany and Poland.
* How was the feasibility of the GFQ tested in real practice? A mixed method study was followed in Belgium, The Netherlands, and France to obtain the final version of the GFQ.
* How did you define the salient terms on diagnostic reasoning used in the publications of the COGITA group? A glossary of terms was constructed following a literature review.
* The differences which occurred in the definitions and translations of gut feelings and the connected concepts led to a comment on the article “Recognition of sepsis in primary care: a survey among GPs” written by Loots et al, and their use of the wording “gut feelings” without describing to which concept they were referring.

The second part focuses on the diagnosis of a life-threatening disease and the diagnostic value of the sense of alarm in general practice with the symptoms of dyspnoea and thoracic pain.

* How did GPs come to suspect pulmonary embolism in real-life settings? A qualitative study with semi structured interviews explored this point. Next, more specifically the role of gut feelings in this diagnostic process was described.
* The results of this qualitative study led to a comment on the Lucassen article on the comparison of the diagnostic performance of “gestalt” and the Wells rule. for ruling out pulmonary embolism in primary care.
* What is the diagnostic test accuracy of the sense of alarm when applied to dyspnoea and chest pain? A prospective study using the gut feelings questionnaire was undertaken with French GPs. The protocol for this study was published and the first results of the prospective study are reported.

Linguistic validation process, mixed method with quantitative and qualitative data, qualitative exploring method with semi structured interviews, prospective quantitative study with a validated questionnaire were the different methods used in this thesis.

First part

**We started** with the translation of the GFQ into French, German and Polish using a standardised procedure of linguistic validation. The collaborating research teams from France, Germany/Switzerland and Poland found and agreed on compromises between comparability and similarity on one hand, and linguistic and cultural specificities on the other. The GFQ is the first tool developed that measures GPs’ gut feelings. There is no alternative tool available at present. The transculturality of the gut feelings concept between Proto-Germanic and Roman languages was revealed after a Delphi procedure comparing the Dutch and the French statements of the gut feelings criteria. The linguistic validation procedures followed allowed us to expand the concept to include Slavic languages such as Polish. We assume that the utility of the GFQ would also be transferable, working within this transcultural context and applying standardised linguistic procedures. The translated and validated GFQ makes it possible to Compare results of research into the predictive value of gut feelings and into the significance of the main determinants in five European countries.

**Then** we aimed at testing the GFQ in real GP practice settings during office hours to check whether any changes were needed to improve feasibility, and to calculate the prevalence of the sense of alarm and of the sense of reassurance of GPs in three different countries. The first step, a think-aloud study and a feasibility study, led to small modifications concerning the order of items, and to some small adaptations of the wording of two items. The modified version of the GFQ was created without altering the sense of the seven validated items. The second step, a repetition of the feasibility study but with the modified questionnaire, led to minor changes. The prevalence of the gut feelings in the two phases of the feasibility study, 23 and 31 % respectively, were similar in Belgium, France and the Netherlands. The questionnaire was modified after the two phases of the study. Now we have a questionnaire formatted by GPs, for GPs, working in three European countries. The final version of the GFQ proved to be a feasible and practical tool to be used for prospective observational studies in daily practice.

**The next study** related the construction of a glossary of diagnostic reasoning terms regarding to the research of gut feelings, by the COGITA group. The researchers reviewed relevant literature, aiming to define salient terms, used in their publications. They described the terms, cross-reviewed the wording and reached consensus within the group. Two sections were created: (1) a diagnostic reasoning section that describes concepts such as analytical and non-analytical reasoning processes, clinical mind lines, and intuition, and (2) a research methods section describing concepts such as linguistic validity and saturation. Defining terms in the area of decision making developed by a European expert consensus, based on a literature review and gathering them in an open access glossary is an unique initiative. This glossary was a prerequisite to conduct further research with the intention to create teachable knowledge as well as a basis for cross-border research in general and family medicine. We made the glossary freely available (published on the website [www.gutfeelingsingeneralpractice.eu](http://www.gutfeelingsingeneralpractice.eu)) in order to share our results with other researchers, and to extend our scientific network. The glossary was considered as a source of background filling the gap of the specificity of diagnostic reasoning in general practice.

Second part

First it was explored how GPs came to suspect pulmonary embolism in real practice settings. Another objective was to describe more specifically the role of gut feelings in this diagnostic process. Before using any prediction rule oriented towards this particular diagnosis, a GP should have some suspicion of PE and it is precisely this initial stage which is unclear. The diagnostic process leading to the suspicion of PE is not well described in primary care. Therefore a thematic analysis of 28 semi-structured qualitative interviews was performed, by three researchers, using a Grounded Theory coding paradigm. The suspicion of pulmonary embolism arose out of four considerations: the absence of indicative clinical signs for diagnoses other than PE, a sudden change in the condition of the patient, a gut feeling that something was wrong and a failure to diagnose PE in the past. The GPs interviewed did not use any prediction rule or score in their diagnostic process. The perception of alarm compelled the physician to quit his routine-based reasoning to an analytical reasoning by generating and considering the PE hypothesis. If they had a gut feeling that there was something wrong, that it could be a PE, then they decided to refer the patient to the hospital specialist. The sense of alarm acted as a feedback mechanism at a very early stage of the diagnostic process, allowing the questioning of a possibly wrong diagnostic reasoning direction.

The objective of **the next study** was to calculate the diagnostic test accuracy of a GP’s sense of alarm when confronted with dyspnoea and chest pain. A prospective study with 25 French GPs who filled in the GFQ after each consecutive consultation for chest pain and dyspnoea collected 235 questionnaires with a sense of alarm or a sense of reassurance. Experiencing a sense of alarm when a patient consults a GP for chest pain and or dyspnoea implies that the patient has a 35% probability of life threatening disease when the initial estimated probability was 20% (LR+ = 2.12 [IC95 = 1.49; 2.82]). The negative Likelihood ratio was (LR- = 0.55 [IC95 = 0.37; 0.77]). Not experiencing a sense of alarm decreases the probability of having a life-threatening pathology from 20 % to 12%. The sensitivity of the sense of alarm was 0.608 [IC95 = 0.475; 0.725] and the specificity was 0.713 [IC95 = 0.679; 0.75]. In vague and uncertain situations of chest pain and or dyspnoea where it is difficult for a GP to make the right management decision a gut feeling proved to be a helpful tool in their reasoning process.

The general discussion addresses the strength and weaknesses of our studies and offers some comments on error prevention in primary care. It then discusses some educational notions.

The gut feelings criteria have been formulated from the GPs’ descriptions of their own practices. The ‘sense of reassurance’ and the ‘sense of alarm’ constitute a dynamic element in a GP’s diagnostic process, helping to commute between non-analytical and analytical diagnostic reasoning. The Gut Feelings Questionnaire was translated into French, German and Polish languages following a standardized procedure of linguistic validation. The GFQ was then tested in real practice settings during office hours to check its feasibility in Belgium, France and The Netherlands. The sense of alarm was identified as one major factor conducting to the positive diagnosis of pulmonary embolism after analyzing qualitative interviews of GPs. The GFQ was also used in a prospective study aiming at calculating the accuracy of the sense of alarm when facing a thoracic pain and a dyspnea at GP’s office. Feeling a sense of alarm in this situation drove the GPs to the diagnosis of a severe disease 2 times more than without. The sense of alarm can be seen as a complementary tool for learning how to prevent error in primary care. It is the first model where error prevention is associated with decision making at a very early stage in general practice. Further research concerning cancer suspicion and teaching the gut feelings should be promoted.