Growing to be a general practitioner: tolerance of uncertainty and facing the risk of medical errors

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Academic dissertation

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Helsinki, Finland 2014
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**List of abbreviations**

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<th>Abbreviation</th>
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<tr>
<td>CanMEDS</td>
<td>the Canadian Medical Education Directives for Specialists</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>CDRs</td>
<td>cognitive dispositions to respond</td>
</tr>
<tr>
<td>CT</td>
<td>Computer tomography</td>
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<tr>
<td>EBM</td>
<td>Evidence-based-medicine</td>
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<tr>
<td>ECG</td>
<td>Electrocardiogram</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency Department</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>HaiPro</td>
<td>Hiattatapahtumien raportointiprosessi (The process of reporting harmful incidents)</td>
</tr>
<tr>
<td>PBL</td>
<td>Problem based learning</td>
</tr>
<tr>
<td>PSN</td>
<td>Patient and Safety Net</td>
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<tr>
<td>SCA</td>
<td>Suboptimal cognitive acts</td>
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<tr>
<td>WONCA</td>
<td>World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians</td>
</tr>
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List of original publications

1. Nevalainen MK, Mäntyranta T, Pitkälä KH. Facing uncertainty as a medical student - A qualitative study of their reflective learning diaries and writings on specific themes during the first clinical year. Patient Education and Counseling 2010;78:218–223


Abstract

The ability to deal with uncertainty and to avoid medical errors is crucial for physicians working in primary care. The work of a general practitioner (GP) is challenging and requires a wide range of knowledge and skills. Yet, it is impossible to know everything. Students should also be prepared to face these challenges to be able to work at a health centre. The aim of this study was to investigate medical students’ and primary care physicians’ feelings of uncertainty, experiences of medical errors and ways of coping with them, and attitudes towards the career of a GP.

This investigation involved three sets of material, and both qualitative and quantitative methods were used. In the first study, 3rd- and 4th-year medical students’ learning diaries were used to explore the experiences and feelings related to their first patient contacts. In the second and third studies a survey of fifth-year medical students was used to investigate the prevalence of their tolerance of uncertainty, fears of committing medical errors, and their perceptions of a GP’s work. In the fourth study a survey of younger (working experience ≤5 years) and experienced physicians (working experience >5 years) at health centres was used to study their tolerance of uncertainty and experiences related to medical errors. Factors predisposing physicians to medical errors and means to avoid committing them were assessed.

Study I involved analysis of 22 students’ learning diaries (n=79) and writings on specific themes (n=94) – altogether 356 pages – during their first clinical year. The data were analysed by thematic content analysis. The topics “uncertainty” and “medical errors” were studied in more detail. Studies II and III are based on the responses to a cross-sectional survey of 5th-year students (Study II, n=307 and Study III, n=309, response rate 86%) during their main course in general practice. Study IV concerned younger (n=85) and experienced physicians’ (n=80) responses to an electronic survey related to uncertainty and experiences of medical errors (response rate 68%). In the second, third and fourth studies the responses were cross-tabulated. The variables are presented as means with standard deviations and percentages. Comparisons of categorial variables were carried out by using the X² test or Fischer’s exact test, and comparisons of non-normally distributed continuous variables were carried out by using the Mann-Whitney U-test. (P values <0.05 were considered significant.) 95% confidence intervals are presented for the most important results. Logistic regression analysis was performed to explore which factors predicted good tolerance of uncertainty among GPs.

A developmental path among the 3rd- to 4th-year medical students was discovered regarding their experiences of uncertainty and fears of committing a medical error. All students wrote about several aspects of uncertainty. The students were worried about their professional skills and their credibility in front of patients. In addition, they were confused about the inexactness of medicine, as they saw inconsistencies in medical records. They also feared making mistakes. However, as early as during the first year of clinical studies they started to be more confident in coping with responsibility and stated that they considered themselves to be sufficiently good doctors.
The 5th-year medical students were divided clearly into two groups based on their tolerance of uncertainty and fear of committing a medical error. Those who tolerated uncertainty quite well or well (n=240, 78%) were older, more often males, and they had been working for a longer time as locum doctors than those tolerating uncertainty poorly (n=67, 22%). Of those tolerating uncertainty poorly, 100% were afraid of committing a medical error, whereas of those tolerating uncertainty well or quite well 86% were afraid of committing an error. These two groups did not differ from each other in how they felt about the attractive features of a GP’s work. However, those tolerating uncertainty poorly felt more often that a GP’s work is too challenging and difficult and involves too much responsibility. This group considered less often, however, that a GP deals too much with non-medical problems.

Males and females did not differ in their opinions concerning which aspects of a GP’s work they considered attractive. About 3/4 of the fifth-year medical students considered the work of a GP to be attractively versatile and challenging. On the other hand, about 2/3 of them considered the work of a GP to be too hasty and pressing. There were also differences. The females thought that a GP’s work is too lonely. The males considered that a GP deals too much with non-medical problems and the work may be too routine and tedious. The majority of the students (82%) considered that the most important aim of a GP’s work is to identify serious diseases in order to refer the patients suffering from these to specialized care.

In the fourth study 6% of the younger physicians and 1% of the experienced physicians tolerated uncertainty poorly. The younger physicians more often feared medical errors (70%) compared with the experienced ones (48%). In addition, the younger physicians more often admitted having committed a medical error (84%) than the experienced physicians (69%), but the experienced physicians apologized more often to their patients when they had committed a medical error. When trying to avoid committing a medical error the younger physicians used electronic databases more often and more often consulted on site than the experienced physicians.

Tolerance of uncertainty seems to develop gradually during the medical studies and this development also continues after graduation. However, not all physicians working in primary care tolerate uncertainty well, even though strong tolerance of uncertainty is often expected of GPs when taking into consideration the wide variety of patients a GP meets and the diseases she/he treats. Students are already aware of the possibility of a medical error and almost all of them are afraid of committing one. The fear seems to diminish somewhat with accumulating experience but is never fully eradicated. In addition, half of the experienced physicians admitted to feeling some fear of committing a medical error. The attitudes of fifth-year medical students reflect their experiences of general practice and they are also partially consistent with reality.
Tiivistelmä

Epävarmuuksen sietäminen sekä virheiden välttäminen ovat olennaisia taitoja perusterveydenhuollossa työskentelevälle lääkärille. Yleislääkärin työ on vaativaa ja edellyttää monipuolisia tietoja ja taitoja. Yleislääkärin on kuitenkin mahdotonta tietää lääketieteestä kaikkea, mitä työssä voi tulla vastaan. Opiskelijoita tulisi valmistella kohtaamaan nämä haasteet, jotta he voivat työskennellä terveyskeskuksessa. Tämän tutkimuksen tavoite on tutkia lääketieteen opiskelijoiden ja perusterveydenhuollossa toimivien lääkärien epävarmuuteen liittyviä tuntemuksia, kokemuksia virheistä ja kuinka he ovat selviytynyt tehtyään virheitä, sekä heidän yleislääkärin työhön kohdistuvia asenteitaan.

Tämä tutkimus koostuu kolmesta aineistosta. Tutkimuksessa on käytetty sekä kvalitatiivisia että kvantitatiivisia metodteja. Ensimmäisessä osatutkimuksessa kartotettiin oppimispäiväkirjojen avulla kolmannen ja neljännen vuoden lääketieteen opiskelijoiden ensimmäisiin potilaskohtaamisiin liittyviä tunteita ja epävarmuuksia. Toisessa ja kolmannessa osatutkimuksessa tutkittiin avulla viidennen vuosikurssin opiskelijoiden epävarmuuden esiintyvyyttä, virheiden tekemisen pelkoa ja yleislääkärin työhön liittyviä asenteita. Neljännessä osatutkimuksessa selvitettiin terveyskeskuksessa työskentelevien nuorten (työkokemusta ≤ 5 vuotta) ja kokeneempien lääkärien (työkokemusta > 5 vuotta) epävarmuuden sietämistä ja millaisia kokemuksia heillä oli virheistä työssä. Tutkimuksessa kysytiin vastaajilta, mitkä tekijät altistavat heitä virheille työssä ja mitkä tekijät puolestaan auttavat välttämään virheitä.

Osatyö I koostuu opiskelijoiden oppimispäiväkirjoista (n=79) ja heidän annetuista teemoista laatinosta kirjoituksista (n=94) – yhteensä 356 sivua – ensimmäisen klinikkavuotensa aikana. Materiaali analysoitiin laadullista aineistolähtöistä sisällön analyysiä käyttäen. Aihealueet epävarmuus ja virheet valittiin tarkempana tarkasteluun. Osatyö II ja III perustuvat poisikkealaiskyselyyn, johon vastasivat viidennen vuosikurssin opiskelijat (osatyö II, n=307, osatyö III, n=309; vastausprosentti 86%) yleislääketieteen varsinaisen kurssin aikana. Osatyö IV on terveyskeskuksiin kontaktihenkilöille lähetetty ns. mukavuusotoksena tehty elektroninen poisikkealaiskysely, joka selvitti nuorten (n=85) ja kokeneempien lääkäreiden (n=80) epävarmuuden sietämistä sekä kokemuksia työssä tehdyistä virheistä (68%). Vastaukset ristiintaulukoitettiin toisessa, kolmannessa ja neljännessä osatyössä. Muuttujat esitetään keskiarvoina, joille on laskettu keskihajonta ja prosenttiosuudet. Vertailut kategoristen muuttujien välillä on tehty $X^2$ – testillä ja Fischerin eksaktilla testillä ja ei-normaalista jakautuneiden jatkuvien muuttujien kohdalla Mann-Whitney U-testillä. P-arvot <0.05 ovat merkitseviä. Tärkeimmille tuloksille on laskettu 95% luottamusväli. Logistista regressioa käytettiin selvittämään, mitkä piirteet parantavat perusterveydenhuollon lääkärien kykyä sietää epävarmuutta.

Kolmannen ja neljänneen vuosikurssin lääketieteen opiskelijoita tutkittaessa löytyiit kehityspolku liittyen heidän kokemuksinsa epävarmuudesta ja virheiden pelosta. Kaikki opiskelijat kirjoittivat useita
kommentteja epävarmuudesta. Opiskelijat olivat huolissaan ammatillisista taidoistaan ja uskottavuudestaan suhteessa potilaisiin. Lisäksi he hämmentyivät lääketieteen epätäsmällisyydestä, kun he näkivät epäjohdonmukaisuuksia sairauskertomuksissa. He pelkäsivät myös virheiden tekemistä. Kuitenkin jo ensimmäisen vuoden kliinisten opintojen aikana he alkoivat tuntea itsensä varmemmiksi, selvisivät paremmin vastuunkantamisesta ja ilmoittivat, että hyväksyvät itsensä riittävän hyvinä lääkäreinä.

Viidennen vuosikurssin opiskelijat jakautuivat selvästi kahteen ryhmään epävarmuuden sietämisen ja virheiden tekemisen pelon suhteen. Epävarmuutta hyvin sietävät (n=240, 78 %) olivat vanhempia, useammin miehiä, ja he olivat työskennelleet pidemmän aikaa lääkärin sijaisina kuin huonosti epävarmuutta sietävät opiskelijat (n=67, 22 %). Kaikki epävarmuutta huonosti sietävät pelkäsivät virheiden teknistä, kun taas vastaavasti epävarmuutta hyvin sietävästä oli 86 % pelkästä virheiden tekemistä. Nämä kaksi ryhmää eivät eronneet toisistaan siinä, miten he kokivat yleislääkärin työn houkuttelevat piirteet. Huonosti epävarmuutta sietävät kokivat kuitenkin muita useammin, että yleislääkärin työ on liian haastavaa ja vastuullista. Tämä ryhmä oli kuitenkin muita harvemmin sitä mieltä, että yleislääkärin työ ulottuu liiaksi sairauksien hoitamisen ulkopuolelle.

Miesten ja naisten välillä ei ollut eroa siinä, mitkä yleislääkärin työn piirteet olivat heidän mielestäään houkuttelevia. Kolme neljästä viidennen vuosikurssin opiskelijasta pitäi myönteisenä sitä, että yleislääkärin työ on vaihtelevaa ja haastavaa. Toisaalta noin kaksi kolmasosaa heistä pitäi yleislääkärin työtä liian kiireisenä ja stressaavan. Naiset pitivät miehiä useammin yleislääkärin työtä liian yksinäisenä. Miesten mielestä yleislääkärin työ ulottuu liikaa sairauksien hoitamisen ulkopuolelle, ja naiset työ voisi olla liian arkista ja tylsää. Enemmistö opiskelijoista (82 %) oli sitä mieltä, että yleislääkärin työn tärkein tarkoitus on väestön vaikeiden sairauksien tunnistaminen ja niitä sairastavien potilaiden lähettäminen erikoissairaanhoidoon.

Neljännessä osatutkimuksessa vain 6 % nuoremmista lääkäreistä ja 1 % kokeneista lääkäristä sieti epävarmuutta hyvosti. Nuoremmat lääkärit pelkäsivät useammin virheitä kuin kokeneemat. Lisäksi nuoremmat lääkärit myönsivät useammin teheensä virheitä (84 %) kuin kokeneemat lääkärit (69 %), mutta kokeneemmat lääkärit pyysivät useammin anteeksi potilailtaan, kun olivat tehneet virheen. Virheitä välttääkseen nuoremmat lääkärit käyttivät enemmän tietokantoja ja konsultoivat useammin työpaikan muita lääkäreitä kuin kokeneemat lääkärit.

Sammanfattning

Att tolerera osäkerhet och kunna hanteras med det, och att undvika att göra misstag är grundläggande kunskaper för en läkare som arbetar i primärvården. Att tolerera osäkerhet och kunna hanteras med det, och att undvika att göra misstag är grundläggande kunskaper för en läkare som arbetar i primärvården. Allmänläkarens yrke är utmanande och kräver en bred bas av kunskap och kunnande. Ändå är det omöjligt att veta allt. Man borde också förbereda studeranden för att kunna klara av de här utmaningarna för att de skulle kunna arbeta på en hälsovårdscentral. Målsättningen av denna studie är att undersöka medicinska studerandes och hälsocentralläkares känslor av osäkerhet, upplevelser av medicinska misstag och hur de klarar av dem samt deras inställningar gentemot en karriär som allmänläkare.

Denna studie består av tre olika material och både kvalitativa och kvantitativa metoder har använts. I den första studien användes 3:e och 4:e kursens studerandes inlärningsdagböcker för att undersöka erfarenheterna och känslorna relaterade till deras första patientkontakter. I den andra och tredje studien av femte kursens studerande användes ett frågeformulär som medel för att utforska prevalensen av osäkerhet, rädslor relaterade till att begå misstag och deras observationer om en allmänläkares arbete. I den tredje studien undersökt yngre (arbetserfarenhet ≤ 5 år) och erfarna läkare (arbetserfarenhet > 5 år) tolerant av osäkerhet och upplevers av osäkerhet och misstag. De saker som predisponerade för misstag och de sätt som hjälpte att undvika att begå misstag kartlades.

Studie I består av 22 studerandes inlärningsdagböcker (n=79) och skrivningar om på förhand givna tema (n=94) – sammanlagt 356 sidor – under deras första kliniska år. Data analyserades med tematisk innehållsanalys. Entiteterna osäkerhet och misstag studerades mera i detalj. Studierna II och III baserar sig på svaren från en tvärsnittundersökning som besvarades av femte kursens studerande (stidie II n=307 och studie III n=309; svarsfrekvensen var 86 %) under deras huvudsakliga kurs i allmän medicin. Studie IV inspekterar de yngre (n=85) och de erfarna läkarnas (n=80) svar på en elektronisk kvalitativ kartläggning relaterade till osäkerhet och erfarenheter av medicinska misstag (svarsprocent 68 %). Svaren tvärtabulerades i den andra, tredje och fjärde studien. Variablerna presenteras som medelvärden med standardavvikelser och procenter. Jämförelser med kategoriska variablerna är gjorda med X² testet eller Fischers exakta test, och mellan icke-normalfördelade kontinuerliga variabler med Mann-Whitney U-testet. P-värdet <0.05 anses signifikant. För de viktigaste resultaten har 95 % konfidentsintervallet räknats. För att få reda på vilka särdrag hos doktorerna i allmänmedicin är sammankopplade med god tolerans av osäkerhet användes logistisk regression.

När man undersökte svaren från de tredje och fjärde kursernas studerande hittade man en utvecklingsiktig baserad på deras upplevelser om osäkerhet och deras rädslor relaterade till misstag. Alla studeranden skrev om flera aspekter av osäkerhet. Studeranden var oroliga över sina egna professionella färdigheter och sin egen trovärdighet inför patienterna. Därtill var de förvirrade över otillförlitligheten av medicin när de upptäckte motsägelsefulla uppgifter i patient journalerna. De var också rädda för att begå misstag. Emellertid så tidigt som under deras första kliniska studie började de känna sig mer självsäkra när de hanterades med ansvar och konstaterade att de accepterade sig själva som tillräckligt bra doktorer.
Studerande från den femte kursen delade sig tydligt i två grupper baserade på toleransen av osäkerhet och rädslan för att begå misstag. De som tolererade osäkerhet ganska bra eller mycket bra (n=240, 78 %) var oftare män, och de hade arbetat en längre tid som vikariandes läkare än de som tolererade osäkerhet dåligt (n=67, 22 %). Av dem som tolererade osäkerhet dåligt var 100 % rädda för att begå misstag, emedan av dem som tolererade osäkerhet ganska bra eller mycket bra var 86 % rädda för att begå misstag. De här två grupperna skilde sig inte i det hur de upplevde de attraktiva särdragena en allmänläkares arbete. Emellertid ansåg de som tolererade osäkerhet dåligt att en allmänläkares arbete är för utmanande och svårt och det innefattar för mycket ansvar. Den här gruppen ansåg dock mer sällan att man som allmänläkare behöver ha att göra med för många icke-medicinska problem.


I den fjärde studien tolererade 6 % av de yngre läkarna och 1 % av de erfarna läkarna osäkerhet dåligt. De yngre läkarna var oftare rädda för medicinska misstag (70 %) jämfört med de erfarna läkarna (48 %). Dessutom erkände de yngre läkarna oftare att de begått ett misstag (84 %) än de erfarna läkarna (69 %), men de erfarna läkarna bad oftare om ursäkt av sina patienter när de begått ett medicinskt misstag. För att undvika att begå misstag använde sig de yngre läkarna mer av elektroniska databaser och konsultationer av kollegerna på arbetsplatsen än de erfarna läkarna.

Toleransen av osäkerhet verkar utvecklas gradvis under de medicinska studierna och utvecklingen fortsätter också senare efter slutförda studier. Emellertid har inte alla läkare som arbetar inom primärvården en bra tolerant av osäkerhet, fastän man oftast förutsätter en hög tolerant för osäkerhet av allmänläkare när man tar i beaktande den vida variationen i patienter en allmänläkare träffar och sjukdomar som hon/han sköter. Studerande är redan medvetna om möjligheten av misstag och nästan alla är rädda för att begå ett misstag. Denna rädsla avtar i viss mån med tilltagande erfarenhet men försvinner aldrig helt. Också erfarna läkare medger att de i viss mån är rädda för att begå misstag. Inställningarna av femte kursens studerande ger uttryck för deras erfarenheter av allmänmedicin och de överensstämmen även delvis med verkligheten.
2. Literature review

2.1. Uncertainty in medicine

2.1.1 Approaches to the study of uncertainty in medical decision-making

Uncertainty in medical decision-making is a familiar concern for all physicians, especially for generalists such as GPs, specialists in general internal medicine, geriatricians, paediatricians and psychiatrists (Johnson et al. 1988, Gerrity et al. 1990, Gordon et al. 2000, Seaburn et al. 2005). Because of the nature of their work GPs are especially prone to deal with uncertainty in medical decision-making (Hewson 1998).

Uncertainty has been explored in the medical literature from various perspectives (Table 1). It may be approached and defined as inner feelings of a physician, e.g. stress or anxiety caused by uncertainty, attitudes (such as ignorance) towards uncertainty or how physicians cope with it. Uncertainty has also been studied from a more “objective” or organizational perspective, as uncertainties and risks in medical decision-making result in misunderstandings, missed diagnoses and inappropriate treatments. These studies approach uncertainty by exploring, for example, which factors cause uncertainty and how it can be minimized in medical decision-making.

All phases in patient encounters may awaken a physician’s inner feelings of uncertainty and thus cause uncertainty in medical decision-making, with the threat of making medical errors. These phases cover dealing with a patient’s concerns and needs (Ghosh, 2004a), evaluating the contents of a patient’s history, clinical examination, eventual laboratory or other findings (Schneider et al. 2010), and the prescribing of medicines or the choosing of other treatments (O’Riordan et al. 2011).

From an organizational perspective, uncertainty in medical decision-making may be related to various aspects. These may include, for example, a physician’s characteristics or aspects of a physician’s work or the doctor-patient relationship (e.g. Biehn 1982, Haas et al. 2005, Morgan et al. 2007, Blanch et al. 2009, Amalberti & Brami, 2011, Pieper & MacFarlane 2011, Morgan 2013). Some studies have also explored concrete means to decrease uncertainty in medical decision-making (Jaeschke et al. 1994a, McSherry et al. 1997, Langley et al. 1998).
<table>
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<tr>
<th>Main themes</th>
<th>Study focus</th>
<th>Study/Methodology</th>
<th>Main findings</th>
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<tr>
<td><strong>Uncertainty as physician’s inner feelings</strong></td>
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<tr>
<td>Physicians’ responses to, tolerance of and ways of coping with uncertainty</td>
<td>Stress, anxiety or burnout related to uncertainty</td>
<td>Bovier &amp; Perneger 2007 Cross-sectional survey</td>
<td>Younger physicians, females and surgeons were most stressed by uncertainty.</td>
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<td></td>
<td>Schneider et al. 2010 Development of a questionnaire</td>
<td></td>
<td>The more anxious the doctors became because of uncertainty, the more diagnostically active they became, and females were more concerned about bad outcomes than males.</td>
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<tr>
<td></td>
<td>Cooke et al. 2013 Cross-sectional survey</td>
<td></td>
<td>Burnout was associated with dimensions of uncertainty among GP registrars.</td>
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<tr>
<td>Ignorance or denial of uncertainty</td>
<td>Merrill et al. 1998 Cross-sectional survey</td>
<td></td>
<td>Those students who were found to be intolerant of clinical uncertainty were also more prone to rely on high-technology medicine.</td>
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<td></td>
<td>Seaburn et al. 2005 Qualitative study</td>
<td></td>
<td>The physicians responded to patients’ ambiguous symptoms either with “high partnering” or “usual care”. The physicians using usual care tended to deny ambiguity, whereas physicians using a high partnering pattern more readily explored patients’ symptoms and worries.</td>
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<td></td>
<td>Portnoy et al. 2011 Survey</td>
<td></td>
<td>Personal intolerance of scientific uncertainty may lead to doctors omitting information from their discussions with patients, thus diminishing the autonomy of patients.</td>
</tr>
<tr>
<td><strong>Dealing with uncertainty</strong></td>
<td>Hewson et al. 1996 Qualitative study</td>
<td></td>
<td>Doctors use several strategies to manage uncertainty and complexity; e.g. dealing with the fears of patients, eliminating alternative diagnoses, telling about the possible treatment outcomes, discussing the treatment plan and making sure that the patient can understand and comply with it, practicing “wait and see”, planning for the unexpected and telling the patient what to do if the situation changes.</td>
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<tr>
<td></td>
<td>Gordon et al. 2000 Qualitative study + survey</td>
<td></td>
<td>Physicians expressing uncertainty seem to have better doctor-patient relationships and gain more information from patients who play a more active part in the interaction.</td>
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<tr>
<td></td>
<td>van der Weijden et al. 2002. Qualitative study</td>
<td></td>
<td>Diagnostic tests were ordered to deal with insecurity (with own subjective lack of diagnostic capacity) in order to to lessen patients’ worry.</td>
</tr>
<tr>
<td></td>
<td>Ghosh 2004b Review</td>
<td></td>
<td>Strategies to decrease uncertainty and enhance patients’ trust: e.g. meticulous history taking, excluding serious diagnoses, involving patients in shared decision-making, applying EBM.</td>
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<tr>
<td></td>
<td>Morgan et al. 2007 Purposive sample with semi-structured interviews</td>
<td></td>
<td>GPs uncertain of their own clinical skills were more prone to refer patients to specialized care, as were GPs who considered themselves intolerant of uncertainty.</td>
</tr>
<tr>
<td><strong>Uncertainty in medical decision-making</strong></td>
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<tr>
<td>Sources of uncertainty</td>
<td>Variation in patients’ symptoms/signs</td>
<td>Biehn 1982 Review</td>
<td>Uncertainty can be reduced if patients’ real concerns are dealt with, e.g. by meticulous medical history, and reassessments. However, not all problems and uncertainties can be solved by way of consultation.</td>
</tr>
</tbody>
</table>
### Table 1 cont. Approaches in the exploration of uncertainty in medicine.

<table>
<thead>
<tr>
<th>Sources of uncertainty</th>
<th>Patients’ differing expectations</th>
<th>Haas et al. 2005 Review</th>
<th>Challenging patients may have unrecognized psychiatric diseases. Patients may have unrealistic expectations. Somatization tendency, when present, may lead patients to reject psychiatric consultations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misunderstanding in communication</td>
<td>Morgan et al. 2007 Qualitative interview</td>
<td>Doctor-patient communication problems were related to the readiness to refer a patient to a hospital specialist.</td>
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<td></td>
<td>Pieper &amp; MacFarlane 2011 Qualitative, focus groups</td>
<td>Medical students are uncertain regarding misunderstandings with culturally diverse patient populations.</td>
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<td></td>
<td>Morgan 2013 Qualitative</td>
<td>Both GPs and patients can be unaware of frequent misunderstandings. Some methods to avoid them: the physician makes summaries, repeats information for the patient, gives a written checklist to the patient, and invites the patient to ask questions.</td>
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<tr>
<td>Time pressure</td>
<td>Alegría et al. 2008 Qualitative</td>
<td>Diagnostic bias may occur in hasty consultations.</td>
<td></td>
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<tr>
<td>Deficiencies in physician’s knowledge</td>
<td>Blanch et al. 2009 Qualitative study</td>
<td>Medical students explained their uncertainty as being related to their lack of knowledge. Uncertainty expressions had a negative effect on student doctor–patient interaction.</td>
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<tr>
<td>Patients do not always disclose all information</td>
<td>Amalberti &amp; Brami 2011 Review</td>
<td>Patients may be afraid of describing their symptoms, may leave out some relevant information. They may act inappropriately, or react slowly to physicians’ requests for further investigations.</td>
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<tr>
<td>Increasing certainty in medical decision-making</td>
<td>EBM and guidelines may reduce the level of uncertainty in diagnostics and management</td>
<td>Langley et al. 1998 Qualitative interview study</td>
<td>GPs stated using guidelines when uncertain about own knowledge. However, there were many barriers in use and implementation.</td>
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<td></td>
<td>Boyd et al. 2005 Review</td>
<td>Implementing guidelines for an older patient with multiple co-morbid diseases can be harmful, as they were created for single diseases and only a few have recommendations for the elderly.</td>
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<td></td>
<td>Bücker et al. 2013 Qualitative focus group study</td>
<td>The use of EBM takes more time than GPs have at their busy clinics. Guidelines are seen as the golden EBM-standard. EBM is used when dealing with difficult patient cases. Physicians who also teach younger colleagues deliberately use more EBM to be good role models.</td>
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<tr>
<td>Computer programs and checklists may help to reduce uncertainty</td>
<td>McSherry 1997 Statistical models to prevent diagnostic errors</td>
<td>Bayesian models can be used as aids in diagnostic reasoning by imitating the hypothetico-deductive model of reasoning used by doctors. They may reduce uncertainty and premature closure of diagnostic disclosure.</td>
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<tr>
<td>Hypothetico-deductive method in medical decision-making</td>
<td>Jaeschke et al. 1994a&amp;b Series of articles on instructions for readers of Medical Literature</td>
<td>Sensitive diagnostic tests are used in populations with low pre-test probability to exclude serious diseases (e.g. in primary healthcare), whereas specific tests are useful in hospital-based care, where the prevalence of serious diseases is high.</td>
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</table>
It has been argued that evidence-based medicine (EBM) and guidelines of care may be used to reduce uncertainty in physicians’ decision-making (Langley et al. 1998, Timmermans & Angell 2001). However, there have been barriers to the implementation of guidelines, such as time pressure (Bücker et al. 2013), and multi-morbid patients have often been excluded from original trials, and, thus, implementation of guidelines as regards these patients may be difficult (Boyd et al. 2005). Another point of view has been that implementing EBM helps to understand uncertainty and makes it easier for hospital-based and primary-care physicians to discuss areas of patient care where consensus is harder to establish (Ghosh 2004a). However, contradictory ideas have also been presented. Epistemological uncertainty, i.e. uncertainty related to still obscure areas of medical knowledge, may undermine the reliability of EBM in specific situations (Kirkegaard et al. 2012). One example is the primary prevention of cardiovascular disease with cholesterol-reducing medicine in asymptomatic individuals (Kirkegaard et al. 2012). Implementation of EBM practice guidelines may even be harmful in multi-morbid patients (Boyd et al. 2005). EBM can well be used in everyday practice as a guideline, but not as a “cookbook” for every case, because all patients are individuals (Tanenbaum 2012). In the UK, 16% of the clinical questions physicians posed to two British primary-care answering services were not answered because of a lack of evidence (Davies 2011). However, guidelines could be of help to answer 40% of the questions posed (Davies 2011).

Uncertainty is a major topic in primary care, since GPs deal with different presentations of the same illness, often with the very first signs as well as later stages of disease (O’Riordan et al. 2011). General practitioners have different strategies to diagnose diseases compared with hospital-based specialists. They have to be able to exclude the most serious possibilities with sufficient certainty, while still being able to approach the right diagnosis – often using time to consider less serious possibilities (Keinänen-Kiukaanniemi & Honkanen 2005). GPs use sensitive diagnostic tests and corresponding questions in history-taking in order to exclude serious diseases. A low pre-test probability has an impact on how sensitive and specific tests produce post-test probability (Jaeschke et al. 1994a, 1994b). A negative result in a highly sensitive test can exclude serious disease, whereas false positives may lead to further tests.

Thus, the work of a GP includes many true “objective” uncertainties which may result in feelings of insecurity in a doctor.

2.1.2 Historical perspective on studies of uncertainty

Uncertainty in medicine has been investigated for at least five decades. Uncertainty as a concept was first introduced into the medical field by way of the pioneering study carried out by Renee C. Fox (Fox 1957). As a sociologist she conducted a research project following medical students in different clinics and also interviewed them as regards their attitudes and opinions of medicine as a science and their own experiences and feelings related to their studies. She launched her ideas on tolerance of
uncertainty and how important a role it has in the professional development of medical students. She stated that tolerance may accumulate when students are trained in the areas where they feel uncertain.

After Fox’s studies the concept of uncertainty was readily adopted by other researchers in this field. However, whereas Fox explored feelings of uncertainty and tolerance towards it, many others comprehended uncertainty as risks in medical decision-making, leading to missed diagnoses or inappropriate treatments. For example, some researchers have argued that physicians should be trained in certainty instead, because only a minority of physicians work in the way that scientists do, doubting and testing their hypotheses in an attempt to diminish existent uncertainty concerning a particular patient (Atkinson et al. 1984). Moreover, it has been stated that most experienced physicians are pragmatic in their work and rely on their accumulated knowledge when treating patients, and in doing so are less prone to uncertainty in their everyday work (Atkinson et al. 1984). Other researchers have suggested that training medical students to tolerate uncertainty would support them and, thus, they might find their way to primary care (Schrauth et al. 2009).

2.1.3 Exploring sources of uncertainty

Even as undergraduates medical students are faced with uncertainties in medicine. Light (1979) defined five different sources of uncertainty that medical students are faced with. 1) How their medical teachers behave towards patients. All medical teachers have different personalities and personal preferences, and the students have to conform to that. There is no way that all teaching at the same department by different teachers could be uniform because of this variability. 2) Limitations of knowledge inherent to the profession, i.e. there will always be something new to discover in medical science, and no-one can ever know everything. 3) Problems and uncertainties related to the diagnostic process, i.e. very few diagnoses can be 100% sure because of the problems related to the diagnostic process. Some information may be lacking, the patient may not be co-operating or the clinical picture may be obscure. The test results may be unclear, and there are always false positives and false negatives. 4) Uncertainties related to the treatment options and responses to treatment. There are often several treatment options to choose from. The outcomes of treatment are dependent on many factors, including, for example, patients as individuals with different metabolic pathways. 5) Compliance issues. Not all patients follow physicians’ treatment suggestions, thus obscuring the healing process. (Light 1979)

The sources of uncertainty in a physician’s work have also been defined and categorized by Beresford (1991). They are: 1) Technical. The field of medical technology (laboratory, imaging and related facilities) is expanding. Some physicians may underuse technology because of a lack of knowledge or skills. Some physicians may overuse diagnostic tests, when in doubt, whereas others may trust them too blindly, forgetting to take into consideration the possible false positives or false negatives. 2) Personal, i.e. related to the doctor-patient relationship. This can be twofold: either the patient is unable to tell about his/her wishes, health needs etc., or the patient and the physician are too familiar with each other,
and the physician is not objective enough in her/his medical decision-making. 3) Conceptual. Guidelines have been developed for a hypothetical average patient, and it can be difficult to apply guidelines to the variety of real life patients.

A number of researchers have explored patient-related sources of uncertainty. Every patient is an individual and so are their medical problems, and patients do not always tell all the necessary facts to their physician. Patients may also undervalue a physician who does not send them to undergo several radiological or laboratory examinations (Biehn 1982). Patients may also search for a “second opinion” on the internet when their physician does not provide them with a satisfactory answer (Henry 2006). Physician’s communication with a patient always includes some degree of uncertainty (Morgan et al. 2007). So called “difficult” or challenging patients may also contribute to increased uncertainty. It may be a tough challenge to find the right way to approach a patient who is presenting with several, mainly social problems and who already has numerous types of medication for a variety of diseases, and who is perhaps also unable to fully comply with the treatment offered (Haas et al. 2005, Amalberti & Brami 2011, Merrill et al. 2013).

Uncertainty may also be knowledge-related (Blanch et al. 2009). There are few absolute truths in medicine (Biehn 1982) and there will always be some medically unexplained symptoms that puzzle physicians (Seaburn et al. 2005). There are always gaps in an individual physician’s knowledge, e.g. when prescribing medicines, about how safe certain drugs are for certain patient groups (Mikhail et al. 2007). There is some “myth-making” going on among different generations of physicians in order to deal with uncertainty, based on tradition, common sense and experience, when evidence is scarce (Kaufman et al. 2013). Such myths can be passed on by elder respected colleagues to younger physicians who may accept them as truths. An example of this is the belief that patients with atrial fibrillation of less than 48 hours duration do not need anticoagulation treatment before cardioversion (Kaufman et al. 2013).

2.1.4. Why is the concept of uncertainty important to general practitioners?

Tolerance of uncertainty is an important issue in general practice, as the variety of unselected patients a GP meets leads to a particularly big burden of uncertainty (Donner-Banzhoff 2008). General practitioners meet patients at the early stages of disease; thus, they may have mild or obscure symptoms which complicate the diagnostic process (O’Riordan et al. 2011).

It has been argued that in general practice a large proportion of patients’ complaints cannot be connected to a certain known diagnosis or analysed by way of pre-determined diagnostic criteria even after a thorough investigation of medical history and a physical examination (van der Weijden et al. 2002). Such patients may prompt some physicians less tolerant of uncertainty to order excessive diagnostic tests (van der Weijden et al. 2003) or other further investigations (Woivalin et al. 2004) just to be sure that it is nothing serious. Situations which may predispose physicians to less measured
ordering of diagnostic tests can be, for example, when the patient is very worried about the symptoms, or when the physician is simply too tired to stop and think again (van der Weijden et al. 2003). As many as 13% of consultations in general practice in the Netherlands met pre-determined criteria for unexplained and usually self-limiting complaints (van Bokhoven et al. 2012).

Low tolerance of uncertainty might lead to avoidance of specialties such as family medicine, geriatrics or psychiatry (Johnson et al. 1988, Gerrity et al. 1990, Gordon et al. 2000, Seaburn et al. 2005). It has been suggested that significantly older physicians choose internal medicine, family practice, paediatrics and psychiatry (“personal care specialities”), than, for example, the different forms of surgery (“technology-oriented specialities”) (Lieu et al. 1989). Attitudes of physicians working in family medicine, paediatrics and general internal medicine have been explored in relation to uncertainty (Evans & Trotter 2009). Two different models (epistemologies) were used to describe physicians’ thinking (Evans & Trotter 2009). One model was the biomedical model, which means that a physician has a surgeon-like attitude to patients’ problems, concentrating more on the biological side of a disease (McWhinney 1997). The other was the biopsychosocial model which means that the physician has a more holistic attitude to patients’ problems (McWhinney 1997). The biomedical model was connected to weaker tolerance of uncertainty in work than the biopsychosocial model (Evans & Trotter 2009).

2.1.5 The responses of physicians to uncertainty

Reactions to uncertainty may vary (Schneider et al. 2010) and they have been studied from various perspectives. The responses and attitudes of physicians to uncertainty may include the following: tolerance or intolerance, anxiety, feelings of threat or stress, ignorance, burnout and denial (Biehn, 1982, Merrill et al. 1994, Merrill et al. 1998, Hall 2002, van der Weijden et al. 2002, Seaburn et al. 2005, Morgan et al. 2007, Cooke et al. 2013).

According to the results of an investigation carried out among a sample of 700 physicians in the United States, the most important response to uncertainty seems to be stress (Gerrity et al. 1990). Uncertainty may also provoke anxiety and concern about bad outcomes for patients in physicians’ minds (Bovier et al. 2007, Schneider et al. 2010). Some physicians become stressed by uncertainty, especially if their way of thinking is more disease-centred (biomedical) than patient-centred (biopsychosocial) (Evans & Trotter 2009). Those physicians tolerating uncertainty less well tend to steer clear of general specialities such as general practice, general medicine and geriatrics (Ghosh 2004b). Some physicians react to uncertainty with an aversive attitude when they are still students (Merrill et al. 1994, Merrill et al. 1998). Younger physicians, females and surgeons tend to be more stressed by uncertainty (Bovier & Perneger 2007). Personality factors also seem to play an important role in how physicians react to uncertainty, together with their risk-taking attitude (risk-averse or “risk-seeking”) (Tubbs et al. 2006).

Some physicians order multiple laboratory tests for their patients just to avoid missing anything (van der Weijden et al. 2002, Schneider et al. 2010) and some refer to a colleague or other specialist because
of problems in the doctor-patient relationship, or time pressure (Morgan et al. 2007). As treatments tested by means of randomized controlled trials (RCTs) can be considered efficient, some physicians less tolerant of uncertainty may choose to treat only patients who respond to the tested treatments (Tanenbaum, 2012). Some physicians use diffuse expressions when they experience uncertainty and make use of probabilities to calm the patients’ worry, whereas those reluctant to disclose uncertainty try to ignore it by not mentioning it to the patient (Gordon et al. 2000). Some physicians tend to deny uncertainty (Seaburn et al. 2005). This tendency seems to be dependent on the extent to which physicians want to build a partnership with the patients. Those physicians more prone to building partnerships with their patients also seem more ready to discuss with them the concerns and uncertainties related to care (Seaburn et al. 2005), whereas those intolerant of uncertainty may omit information from their discussion with patients and, therefore, decrease their patients’ autonomy (Portnoy et al. 2011).

A number of studies have been focused on how physicians cope with uncertainty. Intolerant physicians may rely on high-level technology (Merrill et al. 1998) or eagerly refer patients to specialized care (Morgan et al. 2007). Physicians may strive to become so well acquainted with their patients that admitting uncertainty is no longer threatening (Biehn 1982, Gordon et al. 2000). For several physicians, age over 50 of a patient acts as a warning sign and they more readily order laboratory tests when seeing such patients (van der Weijden et al. 2002, Ghosh 2004a, Ghosh 2004b). Physicians may share the uncertainty of some diagnoses with the patient and, for example, negotiate a preliminary decision concerning treatment (Griffiths et al. 2005). Uncertainty may also be diminished by improvising in situations where an unexpected turn of events poses new problems (McKenna et al. 2013). However, it is not possible to improvise without a solid knowledge base. Improvising is used by experienced physicians working together either with other physicians, nurses, or in dialogue with individual patients (McKenna et al. 2013).

There may be differences in the personalities of GPs preferring to work at private clinics versus community health centres (Geneau et al. 2007). Those at private clinics stressed that they preferred the faster tempo of their working days. General practitioners at community health centres were of the opinion that longer appointments offered them a possibility to be more holistic as physicians. With longer appointments they could manage to avoid becoming anxious and insecure because of the fear of missing something important.

2.1.6 Disclosing uncertainty and the doctor-patient relationship

The way in which a physician expresses her/his uncertainty may have a favourable or a detrimental effect on the trust of a patient. It has been suggested that consulting a colleague has favourable effects, whereas consulting a nurse may have detrimental effects (Ogden et al. 2002). A physician who is willing to express uncertainty to a patient may help the doctor-patient relationship to evolve to a more
honest interaction between the two (Henry 2006). It may also make the patient more compliant as regards treatment options when he/she understands the reasons for them (Henry 2006). It has been argued that physicians who are tolerant of uncertainty may also be more humble practitioners, in contrast to such physicians who are too certain of their own knowledge to the point of being almost arrogant (Buetow 2011). On the other hand, disclosure of uncertainty may also have harmful effects on the doctor-patient relationship. Students in an American medical school more prone to express uncertainty were considered by patients to be less trustworthy and poorer communicators than other medical students (Blanch et al. 2009). However, it is possible that the nonverbal behaviours of the students may have affected the patients as well (Blanch et al. 2009). That part of the communication was ignored in the study (Blanch et al. 2009). In Switzerland, when both female and male physicians expressed uncertainty equally in patient encounters, the patients were more satisfied with the female physicians (Cousin et al. 2013). This might imply that other factors not necessarily related to expressions of uncertainty may have an effect on the patients’ overall satisfaction with the doctor-patient encounter (Cousin et al. 2013).

The tolerance of patients as regards physicians’ expressions of uncertainty has also been studied. In one study there was a significant relationship between the dissatisfaction of patients and high levels of uncertainty expressed by physicians (Cousin et al. 2013). There was also a gender difference, as male patients were more dissatisfied with female physicians, if those physicians expressed high levels of uncertainty (Cousin et al. 2013). However, a study among medical students revealed a contrasting situation, since male students’ expressions of uncertainty caused more dissatisfaction among patients than did such expressions from female students (Blanch et al 2009).

2.1.7 How could uncertainty be alleviated?

Physicians have a number of ways to diminish and manage uncertainty in their work. According to Hewson et al. (1996) doctors use several strategies to manage uncertainty in their work. 1) defining the context helps to approach the diagnosis, 2) dealing with the fears of patients may eliminate alternative diagnoses, 3) telling patients about the possible treatment outcomes, 4) discussing together the key problems or issues important to both the patient and the physician, 5) discussing the treatment plan and making sure that the patient can understand and comply with it, 6) staying alert to eventual alternative diagnostic possibilities while choosing one or two most probable diagnoses, 7) being thorough, keeping in mind other serious diagnostic possibilities, 8) practicing “wait and see”, 9) planning for the unexpected and telling the patient what to do if the situation suddenly changes. They called this concept “strategic medical management” (Hewson et al. 1996).

Some physicians, especially as students, strive to create as complete a patient history as possible to diminish uncertainty (Holms & Ponte, 2011). It has been stated that involving patients in the process of decision-making helps physicians to share uncertainty with patients (Gordon et al. 2000).
Check-lists have been presented as one attempt to derive useful information from patients, in order to narrow the scope of diagnostics (Alegría et al. 2008). Computer-assisted diagnostics has also been proposed as a useful tool for some conditions, as the programs might help physicians find the right diagnosis faster and, therefore, speed up the management of patients, thus reducing uncertainty (McSherry 1997). The abundant amount of information is easily accessible via the various databases. Students are willing to use them but there may be a certain generation gap, since not all cohorts of physicians are able to make use of them (Romanov & Aarnio 2007).

Diagnostic uncertainty has been one important reason for referral of patients to specialized care (Wright et al. 1996). Thus, the need to receive “a second opinion” may be a reason to consult specialists. However, referring patients from primary care to specialized care with a low threshold may be problematic, sometimes causing tension between primary and specialized care (Berendsen et al. 2007).

2.1.8 Tolerance of uncertainty

Younger physicians in particular seem to suffer from uncertainty to a greater extent than experienced ones (Geller et al. 1990, Bovier et al. 2007). Schneider et al. (2010) stated that female GPs experienced more anxiety due to uncertainty than males. It has been suggested that family physicians tolerate uncertainty better and have a less aversive attitude towards risks in their practice than specialists in internal medicine (Fiscilla et al. 2000). Contessa et al. (2013) studied surgeons, both residents (i.e. younger physicians) and faculty members (i.e. experienced physicians) and found a difference in their tolerance of risk; the residents were more tolerant than the faculty members and those residents most tolerant of risk belonged to the extrovert personality type. However, according to Massarweh et al. (2009) higher risk tolerance might predispose surgeons to more medical errors. Andruchow et al. (2012) found no relationship between the entities risk taking, stress from uncertainty and malpractice fear of emergency department physicians and head CT use in trauma patients. They suggested that shared decision-making might have been the reason, as the physicians were not working alone, but in teams of at least two persons.

Physicians intolerant or less tolerant of scientific uncertainty may avoid involving patients in decision-making, which may in its turn have an effect on how much information the patients receive (Portnoy et al. 2011). In addition, such physicians, thinking that their patients would be adverse as regards ambiguous or uncertain information, saw it as their right to decide for their patients instead of discussing with them and offering several treatment options (Portnoy et al. 2011). This may at the same time partly deprive patients of their autonomy – their right to accept or decline a treatment (Portnoy et al. 2011).

In one study, male GPs in Norway referred their patients significantly less often than their female colleagues (Ringberg et al. 2013). This may mirror the female GPs’ attempts to reduce uncertainty and
might have consequences in the future for the costs of healthcare, as more and more females are studying to become physicians (Ringberg et al. 2013).

2.2 Medical errors

2.2.1 Approaches to the study of medical errors

Medical errors have been analysed from several different angles. Researchers have tried to define and categorize errors to tackle the problem more precisely. They have explored various types of medical errors, such as diagnostic errors (Graber et al. 2002, Thammasitboon & Cutrer 2013), system-related errors (Nolan 2000, Kalra 2004), communication-related errors (Makeham et al. 2008, Frydenberg & Brekke 2012) and prescription errors (Sayers et al. 2009, Haavik et al. 2010, Khaja et al. 2011).

Physicians’ experiences and attitudes towards medical errors (Gaba et al. 1994, Garbutt et al. 2007, Stangierski et al. 2012) and ways of coping with them have been one focus of research (e.g. West et al. 2006, Wu et al. 2012). Risk factors of medical errors and means to prevent them have been studied extensively (Table 2).

During the last decade medical error research and patient safety studies have moved their focus from individual physicians to a more system-based approach. Both Nolan (2000) and Kalra (2004) argued that errors should be perceived by way of a more systemic approach. According to Nolan (2000), more energy should be invested in system re-engineering, e.g. reducing the complexity of systems, optimizing information processing and involving patients in the process of enhancing the safety of their treatment. Kalra (2004) argued that the attitude of seeing medical error as a problem of the individual should be changed in favour of seeing medical error as a problem of the system instead.
<table>
<thead>
<tr>
<th>Main themes</th>
<th>Study focus</th>
<th>Study/methodology</th>
<th>Short summary of main findings</th>
</tr>
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<tbody>
<tr>
<td>Physicians’ experiences and attitudes towards errors</td>
<td>Experiences</td>
<td>Gaba et. al. 1994 Survey</td>
<td>63% had made an error because of too much work. 10% stated seeing a colleague/surgeon doing something unsafe. The respondents experienced internal pressure, e.g. to avoid litigation, and external pressure, e.g. because of administrative edicts.</td>
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<td>Attitudes</td>
<td>Garbutt et al. 2007 Survey</td>
<td>56% of the respondents believed that system failures are more often the cause of medical errors than individuals.</td>
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<td>Stangierski et al. 2012 Survey</td>
<td>50% of the respondents admitted to having often thought about the consequences of a possible medical error. The existing legal liability for medical errors made 51% more cautious in their work.</td>
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<td>Risk factors of medical errors</td>
<td>Physician’s characteristics predisposing them to errors</td>
<td>Weingart et al. 2000 Review of medical errors</td>
<td>Inexperienced physicians and trainees commit more medical errors.</td>
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<td>Jagsi et al. 2005 Survey</td>
<td>The predisposing factors were working too many hours, receiving inadequate supervision, problems with handovers, cross-covering too many patients.</td>
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<td>Massarweh et al. 2009 Survey</td>
<td>The more risk-seeking the surgeon, the greater the risk of medical errors. Tolerance of anatomical uncertainty predisposed physicians to perioperative errors.</td>
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<td>Zwaan et al. 2012 Patient record check</td>
<td>In 81% of cases diagnostic errors were related to faults in diagnostic reasoning or suboptimal cognitive acts.</td>
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<td>Wu et al. 2012 Survey</td>
<td>The predisposing factors were: ignorance, too many simultaneous tasks, fatigue.</td>
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<td>System problems causing risk of errors</td>
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<td>Kalra 2004 Review</td>
<td>The underlying precursors in human failures can be attributed primarily to latent systemic factors.</td>
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<td></td>
<td></td>
<td>Nolan 2000 Review</td>
<td>Systems can be designed to prevent errors.</td>
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<td>Patient-related factors</td>
<td></td>
<td>Smits et al. 2010 Review</td>
<td>Patient-related factors were involved in 39% of the adverse events.</td>
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<td>24% of the adverse events had been caused by a human mistake. The main three forms of adverse events were: complications from procedures (31%), adverse events related to drugs (21%), infections (11%).</td>
<td>Half of inpatient adverse events resulted from surgery in a 1994 review of acute care hospitals in New York state and a similar result came from a 1995 review of admissions to hospitals in New South Wales and South Australia. Complications from drug treatment, therapeutic mishaps and diagnostic errors were the most common non-operative events. Cognitive errors (incorrect diagnosis, choosing wrong medication) were more likely to be preventable.</td>
</tr>
</tbody>
</table>
2.2.2 Definitions and categories of medical errors

A medical error should be defined in an unambiguous way which researchers can agree upon. Only this way can it be investigated in rigorous research studies that can be repeated and compared with others. However, there is no general consensus as to how a medical error should be defined. The simplest definition is that it is a harmful event that has happened through unintentional, erroneous action by a healthcare professional, which may cause a patient inconvenience, disability or even her/his death (Blendon et al. 2002).

Some definitions of medical error have included both actual and potential harm to patients (Bhasale et al. 1998, Fischer et al. 2006), but others have included only errors leading to actual harm (Rubin et al. 2003). Thus, a broad definition of a medical error also includes “near misses” (Bhasale et al. 1998). The terms “medical error” and “adverse event” have also been discussed, focusing on their differences and similarities and linking them both to patient safety (Kalra 2004). Gallagher and his group (2006) defined a medical error thus: “The failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. Medical errors include serious errors, minor errors, and near misses” (Gallagher et al. 2006a). The entity of “team errors” has also been presented. This was defined as an action or inaction leading to a deviation from the team’s original plans (Helmreich 2000).

Vincent et al. (1993) used the word “accident” as a substitute for the term “medical error”. They interviewed surgical patients who had been injured by their treatment and who were not pleased with the quality of the treatment given. These patients showed extreme distress, accentuated pain and unsuccessful psychosocial adjustment to their postoperative state even a year after the accident (Vincent et al. 1993). At the time the study was carried out it was not common that physicians would take responsibility for what went wrong; thus the hospital staff took responsibility for the injuries of only 21 patients out of 101 (Vincent et al. 1993).

Medical errors have been classified in several different ways; there is no unanimous classification for the time being. Ely et al. (1995) classified medical errors in four different categories: 1) errors related to physician stressors (e.g. being in a hurry or too distracted); 2) errors related to process-of-care factors (e.g. physician’s tendency to result in premature closure in the diagnostic process); 3) errors related to patients (e.g. misleading symptoms and signs); and 4) errors related to physicians’ characteristics (e.g. an inexperienced physician).

A bi-centric classification as preliminary taxonomy to characterise medical errors was developed by Dovey et al. (2002). The classification consisted of the following: 1) process errors, which were divided into several sub-classifications such as errors related to investigations, treatment and communication, and 2) knowledge and skills errors, which were divided into sub-classifications such as misdiagnosis and wrong treatment decision (Dovey et al. 2002).

Only actual errors that had already happened were included in the error classification model developed by Rubin et al. (2003). They included the following entities: errors related to 1) prescriptions, 2) communication, 3) physicians’ appointments, 4) medical or other kinds of equipment like computers, 5) errors in actual clinical care, and 6) “other” errors, i.e. errors not
otherwise classified under the former subcategories (Rubin et al. 2003).

Preventable adverse events in primary care collected via a synthesis of the available literature were classified by Elder et al. (2002), who presented the following categories: 1) diagnosis: a) related to symptoms; i.e. missed or delayed diagnosis because the symptoms in an individual patient were not recognized or were recognized later than was appropriate; and b) related to prevention; i.e. information for an individual patient was not offered or was delayed; 2) treatment: a) by drugs, e.g. choosing the wrong drug or the wrong dose, and b) non-drug treatment, e.g. delayed or omitted treatment for an individual patient; 3) preventive services, i.e. no preventive services were offered to a certain group of people because of unintended omission.

Process errors were also classified in the same study by Elder et al. (2002) in the following categories: 1) clinician factors, related, e.g., to judgment; 2) communication factors, e.g. between a clinician and a patient; 3) administration factors, e.g. whether or not the clinician had all the necessary equipment and information available while seeing a patient; and 4) blunt-end factors, e.g. related to government regulations.

Diagnostic errors were categorized by Graber et al. (2002) into three categories: 1) “No-fault errors” that occur because the disease is atypical in its presentation; 2) “System errors” that occur when the system predisposed to errors for some reason; 3) “Cognitive errors” that occur when a physician misdiagnoses a symptom because a patient’s history has been either too superficial or falsely interpreted, the knowledge of the physician is insufficient, or reasoning has gone wrong.

Family physicians’ definitions of an error were studied by Elder et al. (2006). Three areas were found to have an effect on how errors were perceived: 1) the process vs. the outcome for a patient; 2) whether it was a rare or a common incident; and 3) if the responsibility was in the system or on an individual physician (Elder et al. 2006).

Medication errors have been a major concern in medicine and they have been studied very extensively. In Ireland, GPs’ medication errors have been related to risks of drug interaction, wrong dosage, wrong directions for use, legibility of the physician’s handwriting, and allergies (Sayers et al. 2009). The most common erroneous prescriptions were for cardiovascular drugs (Sayers et al. 2009). A nationwide audit of GPs in Bahrain showed that several combinations prescribed were not recommended, such as double forms of hypertensive medication, each having an almost similar effect on the patients, beta-blockers prescribed to asthmatic patients and metformin at doses of 3 g per day prescribed for elderly diabetics (Khaja et al. 2011). Prescription errors made by hospital-based physicians and GPs were compared in Norway and the error rates were 7.1% for the hospital physicians and 1.5% for the GPs. The most common errors (35.6% of all errors) made by the GPs were omissions of the instructions for use of a medicine (Haavik et al. 2011).

Medical errors are bound to be made and some of them even occur with no involvement of either the physician or patient. They have been labelled as “no-fault errors” (Graber et al. 2002).
2.2.3 Occurrence of medical errors

Medical errors are common in everyday practice. It has been suggested that between 44 000 and 98 000 deaths per year occur in United States’ hospitals as a result of medical error (Kohn et al. 1999, Weingart et al. 2000). However, to study their incidence or prevalence is challenging and depends on definitions, methods used and setting.

Sandars & Esmail (2003) claimed that the occurrence of medical errors was 5 to 80 times per 100 000 consultations in primary care. They stated, however, that the original studies involved a variety of definitions and methods to identify medical errors. Table 3 shows how the occurrence of medical errors has been studied in a number of ways, methods and time periods. Rubin (2001) stated that in the U.S. the prevalence was 3.7 errors per 100 000 clinic visits. In New Zealand 6007 primary care treatment claims were explored (Wallis & Dovey 2011). Of all the claims, one third arose from primary care (Wallis & Dovey 2011). Of these, 83% were assessed as minor, whereas 12% were major, 4% were serious (had the potential to result in death or major loss of function) and 1% were very serious (resulting in death or major loss of function) (Wallis & Dovey 2011).

Table 3. The occurrence of medical errors in primary care consultations.

<table>
<thead>
<tr>
<th>Study</th>
<th>Context</th>
<th>Design</th>
<th>Occurrence</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhasale et al. 1998</td>
<td>Primary care, reported errors</td>
<td>An observational study based on a modified critical incidents technique</td>
<td>805 incidents during a time period of 1 year, 9 months</td>
<td>76% were preventable, 27% had potential for serious harm.</td>
</tr>
<tr>
<td>Rubin et al. 2003</td>
<td>Primary care, error rate</td>
<td>Survey in order to develop a classification of errors</td>
<td>31.9 prescription errors/1000 appointments</td>
<td>Counted per clinic visits</td>
</tr>
<tr>
<td>Phillips et al. 2006</td>
<td>Primary care, reported errors</td>
<td>Prospective anonymous reporting</td>
<td>935 errors within 717 events, during 10 weeks</td>
<td>Clinicians, other staff and some patients reported; 96% were process errors</td>
</tr>
<tr>
<td>Gaal et al. 2011</td>
<td>Primary care, 1000 patients</td>
<td>A retrospective review of patient records</td>
<td>2512 errors per 100 000 consultations</td>
<td>70.6% of the initial errors did not harm a patient in the end</td>
</tr>
<tr>
<td>Tsang et al. 2013</td>
<td>Primary care, 74 763 patients</td>
<td>Cross-sectional sample</td>
<td>8 adverse events per 10 000 consultations</td>
<td>Iatrogenic harm in general practice</td>
</tr>
<tr>
<td>Avery et al. 2013</td>
<td>Primary care, 6048 prescriptions</td>
<td>Retrospective case-note review</td>
<td>4.9% (296/6048) of all prescription items</td>
<td>Prescribing and/or monitoring errors</td>
</tr>
</tbody>
</table>
Errors in communication between hospitals and GPs accounted for about 10% of all the possible errors reported in 648 anonymous reports in Australia (Makeham et al. 2008). An example of these was a lack of discharge summaries from the hospitals after the patient had left the hospital to return home (Makeham et al. 2008).

Berner & Graber (2008) presented diagnostic error rates for radiology, pathology and dermatology. It was estimated at less than 5%, and for other specialities studied 10–15%. Gaal et al. (2011) stated that reviewing medical records at random would possibly offer the best estimate for the measurement of patient safety incidents, as they found 211 patient safety incidents in a random sample of 1000 separate patient records. However, hindsight may cause a bias in retrospective analyses (Gaal et al. 2011). Paediatric cardiac surgery teams responded to an error survey and 41% reported that medical errors occur every day in their work environment, and they are mainly medication errors (Bognár et al. 2008). The group also included nurses, however, so the results are not directly comparable to those studies where the respondents were only physicians. Medication errors are very variable, as there can be prescription errors (Gordon et al. 2013), omission errors, meaning that a patient will not receive the correct medication because of some erroneous act (Coleman 2013) and interaction-related errors, meaning that a patient will receive a medicine that is not fully or at all suitable considering the ones he/she already has (Yeh et al. 2012).

The HaiPro reporting system has been developed in order to be able to register possible near misses, actual errors and their consequences, and potential dangers to patients in the healthcare system (Ruuhilehto et al. 2011). According to Ruuhilehto et al. (2011) HaiPro has been an effective tool in achieving a clearer picture of the different incidents in the healthcare institutes in Finland. During a time period of two and a half years, 51% of the 64 405 incidents that occurred were associated with medicaments and the process of medication (Ruuhilehto et al. 2011). These were also the leading type of incidents (Ruuhilehto et al. 2011). However, 2428 out of 12 084 incidents in the UK, representing approximately 20% during eight months, were associated with medication; 61% of those were in turn associated with drug administration and 26% with prescription (Thomas & Panchagnula 2008). During one year, 10% of 25 300 incidents reported to The Patient and Safety Net (PSN) in the U.S. were medication errors (Reid et al. 2009). Several of the PSN system questions seem to be similar or bear a strong resemblance to HaiPro questions, so the reasons for this relatively great difference in the percentages are not completely clear. Table 3 presents some studies in which the occurrence of medical errors has been explored. These particular studies have been chosen as they represent the different types of reporting and studying errors and show how difficult it is to compare occurrences between different studies.

2.2.4 Disclosure of medical errors

The disclosure of medical errors is associated with several challenges, including the experiences and feelings of physicians (Mizrahi 1984, Christensen et al. 1992, Blendon et al. 2002, Gallagher et al. 2006a and 2006b, Garbutt et al. 2007, Kaldjian et al. 2007, White et al. 2008, Hannawa 2009,
Flotta et al. 2012, Souter et al. 2012), the feelings and rights of the patients (Blendon et al. 2002, Levinson 2009, Robbennolt 2009) and the effects of disclosure on the doctor-patient relationship (Christensen et al. 1992). The act of disclosure is also becoming more important as a step in quality improvement (Turillazzi & Neri 2014).

Disclosing medical errors to patients can be stressful for a physician. Feelings of shame and fear of losing a good reputation may make the situation difficult (Wu et al. 1991). In some countries there might even be some additional fears of malpractice claims if a medical error is disclosed to a patient (Goldberg et al. 2002, Studdert et al. 2004, Gallagher et al. 2006a, Levinson 2009). Physicians may even have changed their attitudes to error disclosure, as the act of disclosure has become more burdened by the risks of litigation (Flotta et al. 2012). In Italy 44.5% of interviewed hospital physicians stated that they would discuss a medical error with the patient in question (Flotta et al. 2012). In the U.K. 73% of emergency medicine physicians would do the same (Vincent et al. 1993).

Hannawa (2009) presented an error disclosure model which could be used by individual physicians to evaluate different (patient-related) situations, and help them realize the different outcomes of different forms of action. If a physician chose to hide an error, this model would show what it could lead to in the future. Schuling et al. (1998) also suggested direct guidelines as to how to disclose errors to patients: make time in the schedule for an appointment with the patient who has been affected by the medical error, discuss the situation respectfully with the patient, letting him/her tell about his/her reactions, show regret about what has happened and how it has negatively affected the patient, and keep in touch with the patient after this in order to allow him/her to discuss the incident again if something still feels unclear. However, especially in the U.S., the risks of such an act have been highlighted, because of the different culture regarding the management of medical errors and the legislation favouring prosecution of physicians, instead of settlements between the parties outside of court (Studdert et al. 2004, Gallagher et al. 2005).

For patients the disclosure of medical errors is often a crucial issue, and they prefer a proper apology, need to be able to receive support at the time of crisis when having been a victim of a medical error, and would like to hear about eventual further efforts to avoid such errors in the future (Blendon et al. 2002, Levinson 2009, Jones & McCullough 2013). They should also be provided with all the necessary information about the situation, how they have been injured by the medical error and what will be the outcome for them in the future with eventual further corrective treatment (Robbennolt 2009).

Vincent et al. (1993) argued that medical errors had long-term consequences for patients, as many of them were still suffering a year after the actual incident. According to them, 80% of patients were not satisfied with the information they had received from the hospital staff. Of these patients, 63% considered that the staff were not being empathic towards them. A large sample of physicians who had been patients themselves or relatives of patients in the U.S. were surveyed about their experiences of medical errors (Blendon et al. 2002). In addition, the same survey was presented to laymen. Of the physicians and laymen, 35% and 45% respectively reported that they had experiences of errors, and 30% in both groups of had been personally involved in an error (Blendon et al. 2002). They reported that they had either been informed or apologized to (Blendon et al.
Neither group considered medical errors to be that important a problem in healthcare (Blendon et al. 2002).

Medical students have given positive feedback on courses on medical errors (Halbach & Sullivan 2005, Myung et al. 2012). Halbach & Sullivan (2005) allowed third-year students to practice how to discuss, apologize and take responsibility for an error with a standardized patient. Myung et al. (2012) developed what they called “a patient safety curriculum” and offered that as an obligatory part for all second-year students.

2.2.5 Risk factors of medical errors

Ellonen (2005) presented three different entities predisposing physicians to errors. They are: 1) risks related to the patient; 2) risks related to the physician; 3) risks related to the work itself and the working environment. Patient-related risks include, for example, rare diseases that physicians see seldom in their work. Symptoms and signs may also be atypical or the disease may be in its early stage with very mild symptoms and signs. A physician may not happen to think about the right options and, thus, these patients are difficult to diagnose. There may be communication difficulties with the patient; e.g. a patient may not be able to express symptoms and signs in a clear way. The personality and/or expectations of the patient may also blur a physician’s clinical thinking. Risks related to the physician include, for example, a physician’s lack of knowledge; sticking to the first impression or diagnosis regardless of new evidence; focusing on and sticking to secondary signs which may lead to a wrong diagnosis; lacking examination skills or taking an inadequate history or physical examination; not knowing a patient very well; inability to interpret findings. Risks related to work and the working environment include: inadequate clarity in working processes, poor leadership, poor instructions, lack of time, lack of personnel or their know-how, poor use or poor availability of diagnostic tests, poor transfer of information and a shift in responsibility for patient care. (Ellonen 2005)

Healthcare professionals’ attitudes towards errors and safety may be deviant, as they strive after perfection and errors are seen as unacceptable (Kalra 2004). Physicians, especially surgeons, may believe that their ability to function safely is as good under pressure, as in emergency situations, as it is in less stressful circumstances and that may predispose them to medical errors (Helmreich 2000).

The diagnostic process itself is a very complicated sequence of actions. For example, wrong laboratory or other tests may be chosen if the preliminary diagnosis or hypothesis of diagnosis is not the right one. Even if the right kinds of tests are chosen, interpretation of the results might prove challenging and lead to eventual misinterpretation (Goldberg et al. 2002). Croskerry (2003) stated that family medicine along with internal and emergency medicine is the specialty where diagnostic uncertainty most prevails and missed or delayed diagnoses most common. She also presented the term “cognitive dispositions to respond” (CDRs) that may be predisposing factors as regards medical errors (Croskerry 2003). Examples of CDRs include “confirmation” bias where the physician seeks to find evidence that confirms her/his initial diagnosis and “multiple alternative”
bias where the physician becomes unable to choose from a set of differential diagnoses (Croskerry 2003). Suboptimal cognitive acts defined as faults in diagnostic reasoning may also be predisposing factors as regards errors and patient harm (Zwaan et al. 2012). The need to rely too strongly on memory in complex situations is also a risk factor. Treatment protocols could act as memory aids and also lessen the burden on short-term memory (Nolan 2000).

Sleep deprivation and a heavy work load have been claimed to be important predisposing factors regarding many medical errors in anaesthesiology (Gaba et al. 1994). Similar results have been found in the fields of surgery, including, for example, general surgery and obstetrics and gynaecology, medicine, including, for example, internal medicine and paediatrics, and hospital-based medicine, including, for example, emergency medicine and radiology (Jagsi et al. 2005). When the traditional call night was compared with the newer model of shared night shifts, where the working time is shortened for individual physicians, residents in internal medicine made more medical errors during the traditional call night than during the shared night shifts (Jasti et al. 2009).

Uncertainty may also contribute to the chance of errors (Rowe 2004). Physicians who feel uncertain may make the wrong decisions because they trust their own intuition too much, or at pressured times forget to check for the best mode of action (Rowe 2004).

Differences between less experienced and more experienced physicians’ reasoning processes have been explored and the capacity to come to the right diagnosis is dependent on the level of experience (Eva et al. 2010). Experienced physicians are also less prone to deviate from their initial (accurate) diagnoses than younger physicians, when additional information has been gathered from the patient (Eva et al. 2010).

In one study, the longer a patient had been registered at a practice as a patient with a GP, the more protected the patient was against adverse events (Tsang et al. 2013).

The higher the number of consultations at a general practice, the more frequent became the adverse events (Gaal et al. 2011, Tsang et al. 2013). The use of mobile phones in a general internal medicine setting leading to interruptions may also predispose to medical errors (Wu et al. 2011).

Hospital/community-based paediatricians were asked about reporting and disclosing medical errors and slightly more than 50% of the responders believed that most errors are caused by system failures rather than by individuals (Garbutt et al. 2011).

2.2.6 Responses and ways of coping with medical errors

Coping with medical errors is an important skill for any physician, as errors happen regardless of efforts to prevent them (Reason 2000). From past decades there are few studies on how physicians coped with their errors, as it was the custom that errors were denied or hidden (Mizrahi 1984). As the burden of medical errors became evident and physicians began accepting their own fallibility more, studies on medical errors and how physicians cope with them began appearing in scientific journals. Residents’ (i.e. younger physicians’) experiences of medical errors, especially their ways
of coping, became an important issue (West et al. 2006, West et al. 2009, Venus et al. 2012). How more experienced physicians were coping also became an area of interest and different ways of coping were found (Flotta et al. 2012, May et al. 2012).

Internal medicine residents in the U.S. who reported errors had higher levels of symptoms related to burnout, and also experienced lower levels of personal accomplishment, and they had become less empathic towards their patients (West et al. 2006).

General practitioner trainees have been found to react in several different ways to their own medical errors (Venus et al. 2012). They made changes in the methods of management of a patient case, experienced guilt for the medical errors, felt highly incompetent when they thought they could have prevented an error from happening, and ordered extra tests when a certain type of patient reappeared (Venus et al. 2012). They wished that they could have had more time to discuss and analyse the circumstances surrounding the medical errors with their superiors. They also wished for better support from their supervisors instead of being told that they were incompetent physicians (Venus et al. 2012). Of GP trainees, 57% disclosed their medical errors to their supervisors and 60% had thought about the possibility of litigation that could result from medical errors (Venus et al. 2012).

Talking about medical errors and processing them seems to be helpful (May et al. 2012). Of hospital physicians in Italy, 84% were ready to discuss their mistakes with each other (Flotta et al. 2012). This is consistent with results from the U.S., where 88% of younger physicians discussed their medical errors with their peers (Engel et al. 2006). The figure found in another American study among young physicians was slightly lower, namely 57% (Delbanco et al. 2007). Furthermore, 44% of the Italian hospital physicians reported their medical errors to their supervisors (Flotta et al. 2012). Only 1.2% would try to conceal their medical errors, while 90.2% would not, and the remaining 8.6% were uncertain or undecided in such a situation (Flotta et al. 2012).

Much fewer studies have been conducted on medical errors in primary care settings than in hospital-based settings concerning the experiences of physicians (Sirriyeh et al. 2013). It seems to be of major importance how well errors are managed at the work place when the focus is on emotional aspects and coping (Sirriyeh et al. 2013). General attitudes to medical errors are in a key position, i.e. whether mainly negative attitudes are dominant and blame prevails or whether errors are seen as opportunities to improve quality and to learn (Sirriyeh et al. 2013). The long-term outcomes of errors are not known, as that aspect has been for some reason totally neglected in the studies reviewed (Sirriyeh et al. 2013).

Helpful ways of dealing with a medical error seem to be talking to the patients involved, apologizing and disclosing the medical errors to them, talking to colleagues and/or spouse, and sharing the experience (May & Plews-Ogan 2012).

2.2.7 Reducing medical errors

In emergency medicine there have been efforts to reduce errors for a long time and so-called error
conferences have been organized in order to develop a common programme for error reduction (Vincent et al. 2000). There have also been attempts to minimize medical errors in specialized care by using various more or less concrete methods, e.g. by applying checklists in cases of frequently repeated procedures (Berenholtz et al. 2004), improving team work (Reader et al. 2009), and holding clinical pathological conferences to prevent errors from recurring (Kanai et al. 2012). In primary care, web-based anonymous reporting systems have been developed (Hoffman et al. 2008) and preliminary checklists have been formed (Ely et al. 2011). However, anonymous reporting might be less effective in primary care because of the lack of time to report, inability to recognize events that should be reported and a lack of appreciation of the value of reporting (O’Beirne et al. 2011).

Web-based reporting and learning systems have been developed in some countries in order to reduce medical errors (Hoffmann et al. 2008). The idea in such systems has been to gather (mostly) anonymously information on different medical errors from physicians, in order to let other colleagues learn from the errors and even offer their own suggestions as to how to prevent such errors from reappearing (Hoffmann et al. 2008). However, success has been variable and it has been assumed that not all errors have been documented in the systems. There is no evidence available for the time being on the eventual beneficial nature of the reporting process for the respondents either, as none of them has been registered because of the anonymous nature of the system.

The use of EBM can also help prevent medical errors along with the clinical databases available for many physicians at their workplaces (Goldberg et al. 2002). However, it is important that when EBM and guidelines are used, their limitations should be taken into account, since they cannot always be brought into practice as such for every patient (Tanenbaum 2012). Evidence-based practice has also been presented as one way to diminish quality differences between practices (Tanenbaum 2012). However, it may also blind the authorities planning the distribution of limited means (i.e. financial resources) to those patients who do not fit in the categories of standard patients, thus leaving them in a less favourable position as patients (Tanenbaum 2012).

All physicians and patients could benefit from increased openness about medical errors and their systematic analysis in a supportive environment without blaming anyone (Goldberg et al. 2002). Openness in dealing with medical errors has increased, since medical schools now have courses on medical errors and patient safety (Halbach & Sullivan 2005, Myung et al. 2012).

Efforts have been made to combine the two types of clinical reasoning, analytical and non-analytical, in order to ameliorate the results of the diagnostic process in different kinds of patient contexts. Mamede et al. (2007) suggested the implementation of reflective practice to diminish the occurrence of medical errors. In reflective practice a physician steps mentally back and takes a second look at her or his own reasoning process, when there is something that does not seem right in a complex patient case (Mamede et al. 2007). This may reduce errors. Several strategies to reduce diagnostic error have been presented, for example minimizing time pressures, by simulation (e.g. training videos showing incorrect and correct ways of action), by making tasks easier via offering quick access to useful information (Croskerry 2003) and also by reducing cognitive burden via using cognitive aids, like computer aided detection system (Thammasitboon & Cutrer 2013).
2.2.8 Fear of committing medical errors

In a national anonymous survey probing symptoms of burnout among French GPs in training, as many as 53.1% of the sample of 4050 respondents were afraid of committing a medical error often or every day (Galam et al. 2013).

In Poland 100 physicians in different specialities were asked about medical errors and 82% of the respondents were afraid of committing a medical error (Stangierski et al. 2012). German final-year medical students feared medical errors after graduation, as they had few possibilities to hone their abilities under the supervision of senior physicians (Schrauth et al. 2009). Of a randomly selected group of American resident physicians, only 3/26 of the participants expressed feelings of fear, and those feelings were connected to near-miss situations that could have ended deleteriously for the patients (Engel et al. 2006).

French and French-Canadian physicians working at a paediatric intensive care unit described the situation as very difficult when they had to make decisions at critical moments (Carnevale et al. 2012). They admitted that they were afraid of committing medical errors, because the amount of uncertainty connected with the patients was so huge (Carnevale et al. 2012). Physicians in the U.S. from several specialties (including six family physicians) were interviewed in connection with their most crucial medical errors leading to serious harm or even death of their patients (Plews-Ogan et al. 2013). Those who were able to mature in a positive way after the error were also able to deal with uncertainty better than before the experience. The respondents also commented on becoming more tolerant of imperfection in both themselves and their colleagues and workmates, no longer seeing themselves as infallible (Plews-Ogan et al. 2013).

2.3 Developing professionalism in a GP’s work

2.3.1 Professionalism in a GP’s work

In 2002, WONCA, the World Organization of National Colleges, Academies and Academic Associations of General Practitioners/Family Physicians presented the core competencies for a primary care physician, consisting of the following: community orientation, comprehensive approach, holistic modelling, person-centred care, primary care management, and specific problem-solving skills (Grüninger 2009).

The Royal College of Physicians and Surgeons of Canada have presented the five core competencies of a specialist physician and they are: medical expert, communicator, collaborator, manager, health advocate and scholar (www.royalcollege.ca). The entities tolerating uncertainty and diminishing medical errors can be seen most closely connected with the competencies medical expert and manager, as they are both related to working directly with patients as well as managing their care.
2.3.2. Demands, special features and challenges of general practice

The role of a general practitioner is unique in that patients coming to physicians have a variety of different issues they wish to discuss. There are often social or other problems that are closely linked with a patient’s health problems and a GP might even be the physician for the whole household (Candib et al. 2001).

A GP must also be able to deal with difficult patients or difficult encounters, i.e. with patients who are, for example, angry and/or manipulative, who have psychosomatic symptoms, a psychiatric diagnosis, or are addicted to drugs (Steinmetz & Tabenkin 2001). In addition, those patients who do not conform to management suggestions for their diseases, or who are dissatisfied with their physician for some reason, are high-level utilizers of healthcare resources, or they make repeated visits for unclear reasons and need to be met professionally (Haas et al. 2005). At a primary care walk-in clinic in the U.S. 15% of 500 patients were classified as difficult by the physicians (Jackson & Kroenke 1999). The definition of a difficult encounter included, for example, an underlying mood or anxiety disorder in the patient and higher rates of somatization than in the average population (Jackson & Kroenke 1999). Those physicians who had a negative attitude towards psychosocial problems had more difficulties in encounters with these patients (Jackson & Kroenke 1999).

The patients a GP meets may also have social problems. In GPs’ consultations in Denmark 0.5% of patients presented a social problem as a primary reason for an appointment (Rosendal et al. 2013). These problems included work-related and relationship-related problems (Rosendal et al. 2013). In contrast, in a small sample of patients visiting their GPs in the UK great variation in social problems existed. The patients suffered, for example, from unemployment, debts, racism, insurance claims and loneliness (Popay et al. 2007). These features create challenges adding to uncertainties in a GP’s work. These are also features that may discourage young physicians and make them less interested in choosing a career in primary care.

2.3.3 Attitudes towards general practice

Several studies have explored students’ attitudes to general practice (Henderson et al. 2002, Williamson et al. 2003, Bethune et al. 2007, Scott et al. 2007, Kruschinski et al. 2011, Selva Olid et al. 2012). In a cohort study on medical students in Canada there was a remarkable decline in the students’ interest in family medicine when they had moved from the first course to the second, and it did not revert totally during further studies (Bethune et al. 2007). In a cohort of 5th-year students in Germany the attitudes of the teaching GPs themselves had an impact on the medical students’ attitudes and career plans (Kruschinski et al. 2011). The 5th-year students’ attitudes before and after a rural health curriculum were probed and there was a positive change in opinions towards rural general practice in the responses after the course (Williamson et al. 2003). Deliberately increased contact between final-year medical students and local GPs in the U.K. led to a predominantly positive attitude towards general practice (Henderson et al. 2002).
Final year students in Canada were allowed to justify their choices and state why they had chosen family medicine (Scott et al. 2007). The main reasons they presented in their answers were grouped under four headings: pre-medical school influences, e.g. family members and rural physicians they had met; medical school influences, e.g. good preceptors as role models and clinical training; postgraduate training influences, e.g. the fact that to become a specialist in family medicine takes only two years in Canada; and life-in-medicine influences, e.g. the long-term relationships with patients, variability in work and lifestyle factors like that of wanting to build a family early on in life (Scott et al. 2007).

The attitudes of medical students from different years across seven countries from different corners of the world were looked at in a review in order to find similar trends (Selva Olid et al. 2012). The following seven themes were presented: broad scope and context of practice, i.e. the work field is varied and the GP needs to know something about everything; lower interest or intellectually less challenging, i.e. GPs do not take care of the difficult (somatic) patient problems by themselves, but instead refer to a hospital specialist; influence of role models and society, i.e. negative or positive comments by senior colleagues, family members or the media related to the work of a GP either may or may not have an effect on the students’ career choice; lower prestige, i.e. the status of the work of a GP was considered rather low by some students compared with the hospital specialities; lower remuneration, i.e. some students believed that the salaries were not as good for GPs as for hospital specialists; medical school influences on speciality choice, i.e. the more the students were in contact with GPs and general practice from the early years of the curriculum, the more they knew of general practice and thus became either more or less interested in it as a career choice; postgraduate training, i.e. the shorter length of specialist training (than for hospital-based specialities) of a GP specialist in some of the countries seemed to attract some students to general practice (Selva Olid et al. 2012).

In a national survey carried out in the UK, those who had first chosen another speciality and then changed to general practice gave as reasons for their choice the following: better work-life balance, less stressful working conditions, less competition, and not very long training (Lambert et al. 2012). Job content was, however, less often noted as the reason for changing from another speciality to general practice (Lambert et al. 2012).

Final-year medical students who valued patient contact have been found to be more prone to choose family medicine (Diderichsen et al. 2013). The subgroup of women also emphasized the aspect of combining work with family as one important reason for their preference of family medicine (Diderichsen et al. 2013). The factor “patient orientation” was also very important for those students who were inclined to become GPs in the future (Kiolbassa et al. 2011). However, there are also different paths to general practice in some countries. In France, students with the lowest final examination results are obliged to accept a residency in general practice if there are no vacancies in the hospitals (Lefevre et al. 2010). The reason for this is purely political, as half of the whole work force of physicians has to be GPs and the other half hospital physicians. However, 20.1% of the year 2009 student cohort in France deliberately chose general practice, and 76.7% of them were women (Lefevre et al. 2010).
Attitudes are difficult to change and a lot of work is usually needed to have an effect on some very strongly justifiable attitude. However, it is not impossible to initiate a process in the mind of a younger colleague, if a teacher or a more experienced colleague shows by her or his example that the work is enjoyable and satisfying (Schafer et al. 2000, Henderson et al. 2002, Jordan et al. 2003, Scott et al. 2007). Negative attitudes can also be learnt from the role model of colleagues, and they may also be one sign that someone is not quite suited for a certain speciality, e.g. general practice, but instead is suited for another, e.g. surgery (Petchey et al. 1997, Schafer et al. 2000, Henderson et al. 2002, Scott et al. 2007).

2.3.4. From novices to experienced physicians: development of professionalism

Physicians go through a maturation process during their studies as they need to learn all the facts and also the professional dimensions of what it is to be a doctor before they graduate. Personal reflection has been found to be a fundamental part in the development of professionalism (Aukes et al. 2007).

Learning diaries have been used as a means to support the professional development of medical students for several years (LaPalio et al. 1983, Finlay et al. 1998, Pitkälä & Mäntyranta 2004). It can be argued, however, that learning diaries may not always give fully valuable information and they may be biased by a variety of possible factors (Pitkälä & Mäntyranta 2004). These factors include the following: those keeping the diary are aware of the fact that the material will later on be analysed, and therefore they might write it in a way they believe might please or interest the reader; those keeping the diary might censor themselves to a certain extent in order to appear better in the eyes of the persons analysing the diaries (Pitkälä & Mäntyranta 2004).

A voluntary group of Swedish final-year medical students was offered the chance to pilot a standardized portfolio that was meant to make and help them reflect on their own professional skills (Haffling et al. 2010). The instructors noticed that the main themes in the portfolios were affective issues, such as attitudes and feelings, ethical problems, clinical reasoning strategies and communication skills, and in the students’ case summaries the main focus was on patient-centred care (Haffling et al. 2010).

Vicarious empathy has been found to decrease during medical education (Newton et al. 2008). Students are socialized to the medical world by teaching terminology and ways of presenting their patients’ histories and symptoms in an objective way used in the official patient journals (Lingard et al. 2003). At the same time students should be able to preserve an empathic way of dealing with fellow human beings. One of the problems in medical education in past times has been that ethics played only a minor role (Robinson 1985). Nowadays, however, ethics is seen as an important part of the curriculum, and new forms of education have been developed by some researchers (Vetrees et al. 2012).

Examples set by teaching GPs seem to have a strong effect on students (van der Zwet et al. 2011). The more the students experienced that they were considered as future colleagues by their GP
teachers, the more interested they became in learning more about how to become a professional GP (van der Zwet et al. 2011).

2.4. Summary of the literature

Uncertainty in medicine has intrigued researchers from the 1950’s to the present. It has been studied from two perspectives: feelings related to uncertainty and the more objectively measurable uncertainty in medical decision-making. Several different sources of uncertainty have been found, from patient-related factors to physician-related factors. Uncertainty may cause stress, may make physicians avoid patients they consider difficult and lead them to choose a career path with less uncertainty. Disclosing uncertainty to patients may have both negative and positive effects on the doctor–patient relationship. Uncertainty seems to burden younger and female physicians in particular. Tolerance of uncertainty is especially relevant for physicians working in general practice.

Medical errors seem to be relatively common, albeit the true prevalence is challenging to study. Errors have been classified as related to physicians or patients, processes or equipment, systems, and “other” factors. Error reduction efforts include: checklists, EBM and guidelines, courses on diagnostics, and system improvement. Physicians are often fearful of medical errors, and medical errors may have a strong impact on both patients and physicians. Ways of coping vary from dysfunctional to highly functional, and supporting both patients and physicians after a medical error has been shown to be essential.

Professionalism is a multi-faceted entity including values and attitudes towards patients, colleagues and co-workers, abilities to cope with the work as well as to take care of one’s own personal well-being as a physician. Professionalism in a GP’s work is challenging, since it includes skills ranging from leadership to a holistic approach to patients, team work and understanding of community orientation. Because of these challenges, general practice has had a waning reputation. However, in recent years some studies have shown that there are means to teach medical students and young practitioners the professionalism of general practice.
3. Aims of the study

The aims of this study were to explore medical students’ and primary care physicians’ feelings of uncertainty, experiences of and ways of coping with medical errors, and attitudes towards the career of a GP.

The specific aims were:

1. To investigate the experiences of 3rd- and 4th-year medical students related to uncertainty in medicine. The study particularly explored how the concept of uncertainty appears in the reflections in their learning diaries, and how their tolerance of uncertainty developed during the first clinical year. (Article I)

2. To explore medical students’ feelings of uncertainty in medical decision-making and fears of committing medical errors when working as a locum resident. Furthermore, the associations of the students’ tolerance of uncertainty and fears of making mistakes with their views of a GP’s work were studied. (Article II)

3. To investigate students’ opinions on attractive and unattractive features of a GP’s work and the views which they consider to be the main aims of GP’s work. (Article III)

4. To clarify the differences between younger and experienced physicians as regards tolerance of uncertainty and their fears of making mistakes and furthermore to explore the predisposing factors behind medical errors as well as the physicians’ means to avoid them. (Article IV)
4. Methods

This investigation involved three different sets of material. The first sample consisted of 3rd- and 4th-year medical students and their reflective learning diaries and writings on specific themes which were analysed in a qualitative study regarding their tolerance of uncertainty (Study I). The second sample (Studies II & III) comprised fifth-year medical students to whom a cross-sectional survey was offered inquiring about their views and attitudes about a GP’s work, facing uncertainty and risk of medical errors. The third sample (Study IV) included younger and experienced primary-care physicians. They were invited to complete an electronic survey on their tolerance of uncertainty and fears of committing a medical error, including their methods of avoiding errors and the factors predisposing them to committing medical errors.

4.1. Participants

Study I. Altogether, 32 medical students starting their first clinical year in 1997 and in 1998 at the clinic of internal medicine were offered an optional one-year portfolio course. Of these, 22 agreed to participate (69%); 10 students in 1997 and 12 in 1998. Their age range was 20 to 24 years and 68% of them were women. Four of the students participated only in the first half of the course, solely writing learning diaries, and another four participated only in the second half of the course. They had been initially randomly selected to their tutor groups. Thus, selection to tutors did not provide a selection bias as to whether or not the students chose the course.

Studies II and III. Fifth-year students from Helsinki University between 2008 and 2010 were asked to answer an electronic questionnaire before their main course in general practice. 307/359 (response rate 86%) of the students responded. The mean age of the respondents was 25.7 years and 64% were females.

Study IV. The participants were gathered from a convenience sample based on health centres collaborating with the Department of General Practice and Primary Health Care of Helsinki University. Contact persons – physicians in charge of continuous medical education in their health centres – were contacted and requested to provide email addresses of their peers and young residents working at their health centres. This method was used to obtain accurate contact information of primary health-care physicians, since these physicians change their jobs constantly and, in addition, they may be on maternity leave or temporarily working at hospitals. This sample consisted of younger and experienced physicians working at different health centres in Southern Finland. Of the contacted physicians, 165/244 responded (response rate 68%). The mean age of the younger physicians, defined as having five years or less of working experience as physicians, was 31.2 years, and 22.4 % were males. The mean age of the experienced physicians, defined as having more than five years of working experience, was 48.4, and 27.8 % were males. (Table 4)
### Table 4. Characteristics of samples included in this investigation.

<table>
<thead>
<tr>
<th>Study population</th>
<th>Medical students</th>
<th>Medical students</th>
<th>Physicians working in healthcare centres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of participants</td>
<td>22</td>
<td>309</td>
<td>165</td>
</tr>
<tr>
<td>Age range</td>
<td>20 to 24</td>
<td>22 to 28</td>
<td>26 to 56</td>
</tr>
<tr>
<td>Males, n</td>
<td>7</td>
<td>112</td>
<td>41</td>
</tr>
<tr>
<td>Context</td>
<td>University of Helsinki 3rd- to 4th-year medical students entering their first clinical year</td>
<td>University of Helsinki 5th-year medical students</td>
<td>Contact health centres in Southern Finland, both younger and experienced physicians</td>
</tr>
<tr>
<td>Type of study</td>
<td>Qualitative</td>
<td>Cross-sectional survey</td>
<td>Cross-sectional electronic survey</td>
</tr>
<tr>
<td>Materials</td>
<td>Students’ learning diaries and writings on specific themes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Article number</td>
<td>I</td>
<td>II, III</td>
<td>IV</td>
</tr>
</tbody>
</table>

### 4.2 Methods

4.2.1. Study I

The requirements for the portfolio course were that the participants would prepare their own personal portfolios consisting of reflective learning diaries, produce writings on specific themes, make self-evaluations, keep logbooks and accept personal feedback from their teachers. They also participated in group discussions three times during that year dealing with the themes that had arisen in the writings. The median time the students spent preparing the portfolios was approximately 20 h.

The instructions presented to the participants for the learning diaries consisted of questions on their experiences associated with medical studies, what they found inspiring, what was difficult, which kinds of interactions the students experienced with personnel at the hospitals and with teachers, what did they learn, where had they succeeded, and how they were coping (Pitkala & Mantyranta 2003).

Their personal portfolios including learning diaries and writings on specific themes were used for analysis. All in all they consisted of 356 pages, 79 reflective learning diaries and 94 writings on specific themes.

These writings have previously been explored and some themes presented (Pitkala & Mantyranta 2003, Pitkälä & Mäntyranta 2004), such as how the students’ images of a good physician reflected on their opinions on themselves; their experiences of hospital culture; reflections on the patients’ experiences of hospitals and illnesses; the students’ values; delicate matters in doctor–patient communication; difficult situations with patients; and the professional development of the students (Pitkälä & Mäntyranta 2003, Pitkälä & Mäntyranta 2004). In the present study the themes related to the medical students’ inner feelings of uncertainty, sources of these feelings, and ways of coping with them were explored.
4.2.2. Studies II & III

The cross-sectional survey had been created for study purposes as well as for probing the eventual preconceptions of the students before their main course in general practice. The respondents were allowed to complete the survey anonymously. The questions were retrieved from previous literature as well and some dimensions based on WONCA tree competences were also included (Petchey et al. 1997, Jordan et al. 2003, Wright et al. 2004, Van Ham et al. 2006, Manca et al. 2007, Grüninger 2009, Nevalainen et al. 2010). These questions were piloted and found easy for the medical students to understand and relevant for them. They were also discussed several times during the 5th-year courses on general practice.

Variables in this questionnaire included demographic factors (age, gender) and the respondents’ experiences working as locum residents.

In the survey we asked the respondents about uncertainty, about their fears of making mistakes and what they would do if they made a mistake (Tables 5, 6 and 7).

**Table 5. Tolerance of uncertainty.**

<table>
<thead>
<tr>
<th>How do you evaluate your tolerance of uncertainty when making medical decisions?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) I have difficulties in tolerating uncertainty in diagnostics and/or medical decision-making</td>
</tr>
<tr>
<td>b) I tolerate uncertainty quite well in diagnostics and/or medical decision-making</td>
</tr>
<tr>
<td>c) I tolerate uncertainty well in diagnostics and/or medical decision-making</td>
</tr>
</tbody>
</table>

**Table 6. Fear of making mistakes.**

<table>
<thead>
<tr>
<th>Are you afraid of making a mistake working as a physician?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Yes.</td>
</tr>
<tr>
<td>b) No.</td>
</tr>
<tr>
<td>c) I have not thought about it.</td>
</tr>
</tbody>
</table>

**Table 7. Dealing with a mistake.**

<table>
<thead>
<tr>
<th>What would you do if you made a mistake?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I would try to hide it</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I would inform my supervisor</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>3. I would tell the patient and offer an explanation</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>4. I would tell the patient and apologize</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>5. I would try to attribute the error to my work community</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

The participants were asked about their views of a GP’s work, ranking them in order of importance from the most to the least important attractive and unattractive features, with numbers from 1 to 5 (Tables 8 and 9).
Table 8. The most attractive features.

<table>
<thead>
<tr>
<th>Which of the following would be for you the most attractive features in a GP’s work that could make you choose to work in primary healthcare?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rewarding work, grateful patients</td>
</tr>
<tr>
<td>Secure and respected job</td>
</tr>
<tr>
<td>Versatile, challenging work</td>
</tr>
<tr>
<td>Well-paid job</td>
</tr>
</tbody>
</table>

Table 9. The least attractive features.

<table>
<thead>
<tr>
<th>Which of the following would be for you the most unattractive features in a GP’s work that make you rethink the possibility of working as a GP in the future?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too hasty and pressing work</td>
</tr>
<tr>
<td>Too much dealing with non-medical problems</td>
</tr>
<tr>
<td>Too much responsibility</td>
</tr>
</tbody>
</table>

There was also a question concerning the students’ opinions about the main aims of a GP’s work and the students were asked to rank them in order of importance (1 to 7) (Table 10).

Table 10. The main aims of a GP’s work.

<table>
<thead>
<tr>
<th>When thinking about the work of a GP, in your opinion, which are the main aims of that work?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying serious diseases in order to refer patients to specialized care</td>
</tr>
<tr>
<td>Treating acute illnesses</td>
</tr>
<tr>
<td>Treating patients’ “minor diseases” like the common cold</td>
</tr>
<tr>
<td>Screening diseases with different kinds of diagnostic tests</td>
</tr>
</tbody>
</table>

Questions and alternatives related to a GP’s work were created from previous literature (Jordan et al. 2003, Van Ham et al. 2006, Scott et al. 2007).

A survey is presented in Appendix 1.

4.2.3 Study IV

The electronic survey was sent as a link in an e-mail message to a convenience sample of contact physicians working in primary care in Southern Finland. A second e-mail was sent as a remainder. The convenience sample was chosen as a method in order to gain as good a response rate as possible, even if the respondents were in that way not completely randomly selected.

The questionnaire in the survey was partly based on the survey presented for the fifth-year medical
students as well as on prior research (Töyry 2005, West et al. 2006).

The survey included demographic variables. The respondents were asked about the contents of their current work (clinical work/administration/teacher or tutor/research/other). They were also requested to tell about their status of specialization or possible intentions to specialize in general practice (working as a locum resident/working as another kind of doctor, not specialized/specialist in general practice/specialist in another speciality, which?). There was a question about how much experience they had had in clinical work (How many years have you worked as a physician in clinical work? _____ years _____ months).

The participants were divided into two groups: those with experience of ≤ 5 years and those with > 5 years. This division was based on the fact that it takes 5 years to specialize in general practice in Finland after graduation from medical school.

The respondents were asked about uncertainty in medicine, using the same question as for the fifth-year medical students (How do you evaluate your tolerance of uncertainty when making medical decisions?) and with the same alternatives (Table 5, p.43). The respondents were also asked about what they had done when they had made a medical error (Table 11).

Table 11. Questions related to medical errors.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you afraid of making a mistake working as a physician?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes/No/I have not thought about it more specifically</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you made a medical error in patient-related work during the past year?</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Have you sometimes thought about the possibility of a patient complaint, an accusation or a lawsuit</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>What did you do when you made a medical error in your work? *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I tried to hide it</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I told my supervisor or a colleague about it</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I told the patient and gave an explanation</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I told the patient and apologized</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>I tried to search for a cause in my work community</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

*These alternatives were created from the literature (Buitrago et al. 1992, Llamas et al. 1997, Gaal et al. 2011).

There was also a question about which factors help them to avoid errors in work (yes/no alternatives). They could choose from the following items: a. Consultations among colleagues at the workplace, b. Consulting a hospital specialist, c. Updating medical education via medical literature, d. Electronic databases, e. Clinical experience. These alternatives were created from the literature (Goldberg et al. 2002).

4.2.4. Analyses

4.2.4.1. Qualitative analysis

In Study I the reflective learning diaries and writings on specific themes were used for analysis. The analysis was performed using thematic content analysis with constant comparison (Pope & Mays
1995, Silverman 2000). At first two researchers read the material and chose themes independently. In cases of discrepancy the researchers discussed in order to gain consensus. In this study the theme “uncertainty” was explored further. To ensure reliability the material was then read and reread several times independently by three researchers. All of them coded the themes related to uncertainty further into subcategories until there were no new themes to be found. Few differences in this analysis were solved by discussion. The findings were tabulated to explore how subcategories appeared in the students’ texts. This also allowed me to explore whether there were any deviating cases. All the findings were also assessed as to how they appeared during the time course of the first clinical year, and the intensity of the themes appearing during that time. This allowed me to create a model of how the students learnt to tolerate uncertainty during the first clinical year.

4.2.4.2. Statistical methods and analysis

Studies II, III & IV were analysed using SPSS and NCSS statistical programs. The variables were presented as means with standard deviations/ranges or as frequencies with percentages. Comparisons of categorial variables were carried out by using the X² test or Fisher’s exact test, and comparisons of non-normally distributed continuous variables were carried out by using the Mann–Whitney U-test. Values of p <0.05 were considered significant. 95% confidence intervals were calculated for the main results. Logistic regression analysis was performed to explore which characteristics of doctors in health centres predicted tolerance of uncertainty, Odds ratio (OR) > 1. Physician’s age, gender, native language, specialization status, fear of committing medical errors, and feeling emotionally drained by work were used as covariates (p value < 0.050).

4.3. Ethics approval

Study I was approved by the University of Helsinki, Hjelt Institute. Permission for Studies II & III was granted by the Planning Committee for Undergraduate Medical Education of the University of Helsinki. Study IV was based on voluntary and anonymous participation in a survey and therefore no ethics committee approval was deemed necessary.
5. Results

5.1. Characteristics of the participants

The study population consisted of two samples of medical students in different phases of their clinical studies as well as a non-homogeneous group of primary health care physicians – both younger ones as well as experienced ones. Table 12 presents their characteristics.

Table 12. The main background characteristics of the participants.

<table>
<thead>
<tr>
<th>Participants in the four studies</th>
<th>3rd- to 4th-year medical students (Study I) N=22</th>
<th>5th year medical students (Studies II &amp; III) N=309</th>
<th>Primary care physicians (Study IV) N=85 Younger (≤5 years of work experience)</th>
<th>Primary care physicians (Study IV) N=80 Experienced physicians (&gt;5 years of work experience)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, years (SD)</td>
<td>22.0 (2.0)</td>
<td>25.7 (3.2)</td>
<td>31.2 (4.8)</td>
<td>48.4 (7.7)</td>
</tr>
<tr>
<td>Gender, male, n (%)</td>
<td>7 (32.0)</td>
<td>112 (36.0)</td>
<td>19 (22.0)</td>
<td>22 (28.0)</td>
</tr>
<tr>
<td>Native language, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finnish</td>
<td>22 (100)</td>
<td></td>
<td>70 (82)</td>
<td>67 (84)</td>
</tr>
<tr>
<td>Swedish</td>
<td>..</td>
<td></td>
<td>8 (9)</td>
<td>7 (9)</td>
</tr>
<tr>
<td>Other</td>
<td>..</td>
<td></td>
<td>7 (8)</td>
<td>6 (7)</td>
</tr>
<tr>
<td>Content of current work, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical work</td>
<td>N.A.</td>
<td></td>
<td>83 (98)</td>
<td>77 (96)</td>
</tr>
<tr>
<td>Administration</td>
<td></td>
<td></td>
<td>1 (1)</td>
<td>21 (26)</td>
</tr>
<tr>
<td>Teaching/tutoring</td>
<td></td>
<td></td>
<td>1 (1)</td>
<td>34 (43)</td>
</tr>
<tr>
<td>Research</td>
<td></td>
<td></td>
<td>2 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Other*</td>
<td></td>
<td></td>
<td>4 (2)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Mean number of months or years (SD) of experience as a locum resident or a physician</td>
<td>no experience</td>
<td>3.2 months</td>
<td>2.4 (1.7) years</td>
<td>19.5 (8.5) years</td>
</tr>
<tr>
<td>Speciality status, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A recently graduated doctor not intending to specialize in general practice.</td>
<td>N.A.</td>
<td></td>
<td>33 (39)</td>
<td></td>
</tr>
<tr>
<td>Other physician in primary care.</td>
<td></td>
<td></td>
<td>9 (11)</td>
<td>15 (19)</td>
</tr>
<tr>
<td>Specializing in general practice.</td>
<td></td>
<td></td>
<td>43 (51)</td>
<td></td>
</tr>
<tr>
<td>Specialist in general practice.</td>
<td></td>
<td></td>
<td>..</td>
<td>49 (61)</td>
</tr>
</tbody>
</table>

*Education coordinator
Of the medical students, one in three was male whereas among physicians working in the health centres one in four was male. The mean ages among the 3rd- and 4th-year medical students and the 5th-year medical students were 22 and 26, respectively, whereas the mean age among the younger physicians in health centres was 31 and among the experienced physicians 48 years. There is a separate curriculum for Swedish-speaking medical students, so nearly all students had Finnish as their native language. However, 9% were Swedish-speaking physicians among the health centre participants and 7% of them had another native language, namely 4% Russian, 2% Estonian, 0.5% Italian and 0.5% Telugu (a language spoken in India). The doctors who answered the survey had been studying in the following countries in addition to Finland (numbers of doctors in brackets): Estonia (3), Denmark (1), Germany (1), India (1), Italy (1), Russia (4) and Sweden (1). There were large variations in the experience of the physicians in our populations. The 5th-year medical students had worked a mean of 3 months as locum residents whereas younger physicians at the health centres had a mean experience of 2 years and the experienced physicians, 20 years. Half of the younger physicians working in the health centres intended to specialize in general practice, whereas two in three of the experienced physicians had specialized in general practice.

5.2. Main findings

5.2.1. Uncertainty, medical errors and professionalism

5.2.1.1 Study I

The group of 22 students dealt with uncertainty from multiple dimensions. The main themes related to facing uncertainty found in their diaries and writings were insecurity concerning professional skills, own credibility in front of the patients, and facing the inexactness of medicine, such as inconsistencies between the interpretations of patients’ symptoms and signs by different physicians. They also wrote about their fear of committing medical errors, coping with responsibility as a future physician, tolerating oneself as incomplete, and thus, accepting oneself as a sufficiently good doctor-to-be. Common steps of development towards tolerance of uncertainty were found in the diaries over a one-year time period as the students progressed in their clinical studies. They seemed to mature from insecure medical students to more experienced young student-doctors. They felt that they had gained more credibility in front of their patients.

All except one of the 3rd- and 4th-year medical students dealt with the theme “insecurity concerning professional skills”, and all except three of the responders wrote about the theme “fear of making medical mistakes”. Whereas the themes related to own credibility and insecurity were prominent at the beginning of the clinical year, the themes dealing with coping with responsibility and tolerating oneself as a good enough physician were more common towards the end of the year (Figure 1).
A developmental path could also be discerned from their learning diaries that pointed to the direction to which they all developed during their transition. In the end they began tolerating themselves better as sufficiently good doctors-to-be, and were less fearful of patient encounters than they had been at the beginning of the course.

Uncertainty and fear of making mistakes seemed to be a major cause of mental strain for medical students, at least in the transitional phase of medical studies from the pre-clinical to the clinical phase. Reflective diaries seemed to be a feasible means to support their development.

5.2.1.2. Study II

During 2008–2010, 307/359 medical students (mean age 25.7 years, 64% females) responded to the electronic survey. Of the respondents, 22% felt they had difficulties in tolerating uncertainty when making medical decisions. The females reported that they tolerated uncertainty poorly more often
than did the males (11%, p<0.001). Those tolerating uncertainty more poorly were also more often afraid of making mistakes (100% versus 86%, p=0.0011). This group tolerating uncertainty poorly stated that they would more often disclose it to a patient and apologize if they had committed an error than those tolerating uncertainty quite well or well (84% vs. 70%, p=0.027) (Table 13).

Table 13. Characteristics of 5th-year medical students according to their gender.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Females N=200</th>
<th>Males N=109</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (SD)</td>
<td>25.3 (2.7)</td>
<td>26.5 (3.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Worked as a locum resident, months, mean (SD)</td>
<td>2.2 (1.9)</td>
<td>4.9 (23.2)</td>
<td>0.25</td>
</tr>
<tr>
<td>Fear of making mistakes, n (%)</td>
<td>188 (94)</td>
<td>85 (78)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Tolerates uncertainty well, n (%)</td>
<td>16 (8)</td>
<td>19 (17)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Tolerates uncertainty quite well, n (%)</td>
<td>127 (65)</td>
<td>78 (72)</td>
<td></td>
</tr>
<tr>
<td>Tolerates uncertainty poorly, n (%)</td>
<td>54 (27)</td>
<td>12 (11)</td>
<td></td>
</tr>
</tbody>
</table>

The group tolerating uncertainty poorly more often considered a GP’s work too difficult and challenging than did the other groups. They also felt that there is too much responsibility in a GP’s work. Those tolerating uncertainty better felt more often that there is too much dealing with non-medical problems in a GP’s work than those tolerating uncertainty poorly. There was no difference between the groups in how they felt about the salary of a GP or long-term relationships with patients (Figures 1 and 2 in Article II).

5.2.1.3. Study III

The fact that a GP’s work is versatile and challenging was considered as the most attractive feature by 76% (N=309) of the students. They also valued the long-term (40%) and comprehensive doctor–patient relationships (36%).

The least attractive features included: work too hasty and pressing (69%), too lonely (51%) and dealing with too many non-medical problems (53%). There were no differences between males and females in their opinions about the attractive features. However, males considered more often than females that a GP’s work is too routine and tedious (30.4% vs. 16.5% respectively; p=0.0048) and that it includes too much dealing with non-medical problems (60.6% vs. 48.5%; p=0.043). The females considered more often than the males that a GP’s work is too lonely (55.5% vs. 43.1%; p=0.037).

The majority of the students considered that the main aim of a GP’s work is to identify serious diseases/disorders in patients in order to refer them for specialized care (82% considering it as the first, second or third important aim). According to 63% of the students the care of chronic diseases is an important responsibility in a GP’s work (considering it as the first, second or third important
aim). Only 20% considered health promotion as the most important aim of a GP’s work.

Tables 1 and 2 and Figure 1 in Article III describe these findings in detail.

5.2.1.4. Study IV

During 2011 165/244 doctors (response rate 68%), i.e. younger (experience ≤5 years, n=85) and experienced physicians (experience >5 years, n=80) responded. The younger physicians tolerated uncertainty more poorly than the experienced physicians. They also experienced significantly more often than the experienced physicians fear of committing a medical error (70.2% vs. 48.1%, p=0.004). They admitted having made a medical error during the past year more often than the experienced ones (83.5% vs. 68.8%, p=0.026). Table 2 in Article IV describes these findings.

The younger physicians were less prone to apologize to a patient when an error had been made than the experienced physicians (44.7% vs. 65.0%, p=0.009). Most factors predisposing physicians to make mistakes (stressful time schedule, consultations with nurses or colleagues, telephone calls and demanding patients) were experienced similarly in these physician groups. The younger physicians found on-site consultations with colleagues and electronic databases more useful in avoiding mistakes than the experienced physicians. The other alternatives were consulting a hospital specialist, updating education via medical literature and journals, and clinical experience. Tables 3 and 4 in Article IV describe these findings.

Logistic regression analysis was performed to explore which factors predicted good tolerance of uncertainty (tolerates “very well”). Having become a specialist in general practice predicted good tolerance (odds ratio (OR) 11.4, 95% CI 2.0 to 65.4), whereas feeling emotionally drained by work predicted poor tolerance (OR 0.15, 95% CI 0.04 to 0.53). Gender, physician’s age or fear of medical errors did not have a predictive value (Table 14).

Table 14. Predictors of tolerating uncertainty in a physician’s work very well.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>OR</th>
<th>95% confidence interval</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender</td>
<td>0.51</td>
<td>0.18 to 1.47</td>
<td>0.21</td>
</tr>
<tr>
<td>Age</td>
<td>1.00</td>
<td>0.95 to 1.06</td>
<td>0.99</td>
</tr>
<tr>
<td>Native language</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finnish</td>
<td>1.00</td>
<td>reference</td>
<td></td>
</tr>
<tr>
<td>Swedish</td>
<td>1.15</td>
<td>0.39 to 3.41</td>
<td>0.80</td>
</tr>
<tr>
<td>Other</td>
<td>0.24</td>
<td>0.03 to 1.74</td>
<td>0.16</td>
</tr>
<tr>
<td>Specialization status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A recently graduated doctor not intending to</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>specialize in general practice</td>
<td>1.00</td>
<td>reference</td>
<td></td>
</tr>
<tr>
<td>Other physician in primary care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specializing in general practice</td>
<td>5.18</td>
<td>1.17 to 23.0</td>
<td>0.030</td>
</tr>
<tr>
<td>Specialist in general practice</td>
<td>2.62</td>
<td>0.81 to 8.45</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>11.4</td>
<td>1.99 to 65.4</td>
<td>0.006</td>
</tr>
<tr>
<td>Feels emotionally drained by work</td>
<td>0.15</td>
<td>0.044 to 0.53</td>
<td>0.003</td>
</tr>
<tr>
<td>Fears committing a medical error</td>
<td>0.36</td>
<td>0.045 to 2.68</td>
<td>0.31</td>
</tr>
</tbody>
</table>
The tolerance of uncertainty in three different groups of our population, medical students, younger physicians and experienced physicians, is described in Figure 2. It suggests that tolerance improves with accumulating years of experience.

Figure 2. Percentages of tolerance of uncertainty in the studied groups.
6. Discussion

6.1. Main findings

This study shows that becoming a physician is a maturation process that involves both active and deliberate processing of various experiences and feelings depending on the actual phase. The results suggest that there is a developmental path regarding how medical students’ feelings change during their clinical years about uncertainty in medicine and how they begin to learn how to master their fear of committing medical errors. The results of this study suggest that tolerance of uncertainty develops relatively rapidly during the course of the studies. However, this development seems to continue during a GP’s career and experienced physicians in primary care have better tolerance of uncertainty than those with less experience.

At the beginning of their clinical years the 3rd- to 4th-year medical students were significantly worried about their own credibility; they were to some extent already afraid of committing a medical error and felt uncertainty towards the real-life situations when meeting their first patients. By the end of their first clinical year, however, they had evolved into more mature and self-assured young doctors-to-be. They began to see themselves little by little as sufficiently good doctors-to-be.

Of the 5th-year medical students, 22% tolerated uncertainty poorly. All of them were afraid of committing a medical error. Those tolerating uncertainty quite well or well were older, more often males and had worked a longer time period as a locum doctor. A minority of medical students would have tried to hide a medical error. According to medical students’ responses, the three most attractive features of a GP’s work were that it is versatile and challenging; there is an opportunity to meet people of different age groups and various backgrounds, and there are comprehensive doctor–patient relationships. The three least attractive features were: too hasty, pressing work; too much dealing with non-medical problems; and too lonely work. Those less tolerant of uncertainty found the work of a GP too difficult and challenging, even though they did not consider social problems to be a central part of a GP’s work.

In primary care, 6% of the younger physicians tolerated uncertainty poorly, whereas the respective figure for the more experienced physicians was 1%. The younger physicians were more afraid of committing a medical error, had committed a medical error more often during the past year, but were less prone to apologize to the patients than the experienced physicians when a medical error had been made.

6.2. Methodological considerations

The use of reflective learning diaries had been a deliberate choice when the student population in the first study was to be taught about how to approach patients as student doctors and which aspects they should pay attention to in their interactions with patients and professionals at hospitals. The results obtained showed that the students were able to reflect both on their experiences of uncertainty and also on scientific uncertainty. Such reflections have been presented as an important part in any doctor’s actions as a practitioner (Aukes et al. 2007). Self-assessment may give
representative information on new phenomena and also offer data for further hypothesis formulation. However, it may be subject to bias, as the respondents may offer answers that they suspect are expected from them, in the same way as may be the case with learning diaries (Pitkälä & Mäntyranha 2003).

A qualitative approach was considered the most appropriate for this topic, since very little is known about the inner feelings of young medical students coping with their first patient experiences. The method is most suitable when new themes are to be found and individual deviant cases can bring new insights, thus building a base for further analysis (Ryynänen & Löytyniemi, 2005).

Qualitative studies can create hypotheses but they can never give definite answers to the phenomenon explored. There were only 22 volunteer students writing diaries. Thus, the representativeness of the sample may be questioned. The students represented 69% of the students who were offered the voluntary course and these students were a random sample of the whole medical student cohort. However, the findings in our study may not be generalized to all medical students. The fact that four of the students participated only in the first half of the course, and another four participated only in the second half of the course may have lessened the variety of the information gained for the analysis to some extent, but the richness of the material leading to the six themes presented earlier may have compensated for the loss, however. As this data is the oldest part we can speculate as to whether or not students of the same age group studying now are still experiencing similar feelings and reflecting their experiences in the same way as our students did. Further studies are warranted in order to clarify this.

The survey for the fifth-year medical students was a compulsory part of their studies and thus yielded a good response rate. We can speculated as to whether or not the results would have been similar had it been voluntary. A quantitative method was chosen for the second and third studies, as the data from the survey was in numerical form. The quantitative method used is well suited for comparison between different groups and for making generalizations from the group studied to other similar groups, as the amount of data processed is normally large (Silverman 2000). It has reliable validity as regards the data in Studies II and III. The results showed that the method was appropriate for both the second and the third studies, as some significant p values were found when comparing the groups of females and males.

Data for the fourth study was gathered via a questionnaire-based survey including self-assessment from a convenience sample of physicians in Southern Finland. This form of information gathering may be subject to bias, as the convenience sample may lead to selection bias. It carries the risk that only volunteers, and thus those interested in these issues respond to the survey. Hence, the results may reflect more the opinions of those who can admit their uncertainties and medical errors. On the other hand, this was the only way to acquire correct email addresses of currently working physicians in the health centres.

The statistical methods were chosen according to the data to be analysed, in order to gain as reliable information as possible, respecting the limitations of the methods. Logistic regression analysis was
performed as the last test in order to be able to find eventual further correlations that could be of value.

6.3. Strengths and limitations

Strengths of this study

In this study we discovered differences between medical students, as well as between younger and experienced physicians’ in regard to attitudes and experiences related to uncertainty and medical errors that were not previously known. The wide age range of physicians at different phases of development, from students to experienced physicians is a unique feature of this study.

The use of both qualitative and quantitative study methods made it possible to gain more information on the entities “uncertainty” and “fears of making medical errors” in comparison with using only one study method.

The study tests have been validated and a multivariate method was also used to find possible correlations and odds ratios when studying the results.

The response rates in the quantitative studies (Articles II, III and IV) appear to be very good.

The results on the attitudes of the 5th-year medical students can be judged as reliable and informative as regards how the students see the work of a GP, as the responders were anonymous and they would not have gained anything if giving untruthful answers to the survey.

Limitations of this study

The participants in the first study may have to some extent censored themselves when they were aware of their teacher reading their writings later on, as some students may avoid writing about their feelings and concentrate on the facts (Pitkälä & Mäntyranta 2003). In addition, they may have – consciously or unconsciously – wanted to please their tutor with their writings; thus, the findings have to be interpreted in this context. Therefore, these findings are not generalizable to other contexts or student populations. However, generalizability would become better if a similar qualitative study were also conducted in other countries, preferably several times among different student populations.

All surveys were cross-sectional in their nature. Therefore, the associations found do not allow me to draw conclusions about causal relationships. The small sample sizes are also a limitation, compared with those in some American studies. However, although the power of these studies was relatively low, several important statistically significant associations were found in the responses.

The retrospective aspect used when asking about physicians’ actual errors is a limitation. Physicians do not always remember everything and some may even choose actively or inadvertently (or even subconsciously) to forget their mistakes. The recollections may also have changed over time to some extent so that the details may no longer be accurate.
More qualitative information on experiences and coping mechanisms could have been gained from the respondents if the survey among the younger and experienced physicians had had more space for open-ended questions.

Although the results of our studies suggest a developmental path in coping with uncertainty and medical errors when gaining experience as a physician, it is not possible to compare the different age groups or draw definite conclusions about the development of physicians. It would be possible to acquire such results by way of a prospective study beginning, for example, from the 3rd year and following the same students throughout their studies, after graduation and into their lives as mature physicians.

6.4. Uncertainty

The youngest students were the most uncertain of their own credibility and of their own knowledge potential. However, accumulating experience from patient contacts made them realize that they could still become competent physicians after graduating. The way how some of the patients treated them gave them positive confirmation of their actions and made them feel more like real doctors. This is consistent with the results of earlier studies (Bell et al. 2009, Weaver et al. 2011). The 3rd- to 4th-year students learned gradually to shoulder responsibility for their patients and thus their uncertainty related to their work as student-doctors with patients gradually lessened. Similar trends have also been found by other researchers (Brennan et al. 2010, Feijter et al. 2011). However, even at the end the students reflected on their fears of making mistakes.

To my knowledge, no previous studies have involved directly asking for physicians’ views on their own tolerance of uncertainty. Therefore, our figures cannot be compared with those in previous studies. It is interesting that tolerance seems to improve as physicians gain experience. Of the 5th-year medical students 22% tolerated uncertainty poorly, whereas the respective figures for younger and more experienced physicians working in primary care were 6% and 1%.

Female students from the fifth year seemed to tolerate uncertainty more poorly than the males. Previous studies have shown a similar trend among female and male GPs (Bovier & Perneger 2007, Schneider et al. 2010). In this study the experienced physicians were more tolerant of uncertainty than the younger ones. This phenomenon has also been revealed in earlier research (Bovier & Perneger 2007).

In the logistic regression model, specialization in general practice was a strong predictor of tolerance of uncertainty. This result is in line with hypotheses presented in earlier studies that physicians seeking broad specialities like general practice are more tolerant to various uncertainties in medicine (Johnson et al. 1988, Gerrity et al. 1990, Gordon et al. 2000, Seaburn et al. 2005).
6.5. Medical errors

Fear of making medical errors was discerned most in the youngest group of doctors-to-be, the 3\textsuperscript{rd}- to 4\textsuperscript{th}-year students. This is consistent with the results of earlier studies (Newell et al. 2008). Most of the fifth-year medical students were also afraid of making a medical error. The tendency seems to abate to some extent with accumulating experience, as the younger physicians were more often afraid of making a medical error than the experienced physicians. The fear did not disappear completely with experience, however, which is consistent with the results of previous research (Galam et al. 2013).

Both the majority of the fifth-year medical students as well as the younger and experienced physicians felt obliged to apologize to their patients for a medical error. Inconsistencies in the responses may be due to the fact that medical students were asked what they would do in a hypothetical situation, whereas the physicians were asked what they had done when a medical error had occurred.

Of the primary care physicians, 55\% had told their patients about a medical error. This is a higher figure than in previous studies (Kaldjian et al. 2008, Flotta et al. 2012). The results of this study suggest that the physicians involved were relatively prone to disclose their medical errors to their patients. The national non-punitive system of patient reimbursement from the Patient Insurance Centre in Finland may have some effect on this, as medical errors can be evaluated objectively without searching for a guilty party and patients receive compensation. In contrast, for example in the U.S., there are tort laws that regulate the legal penalties that physicians may face when having made a medical error (Kohn et al. 1999).

The younger physicians were more prone to tell their supervisors about medical errors than both the fifth-year medical students and the experienced physicians. French GPs in training, i.e. younger physicians, have been found to be less prone to inform their supervisors (Venus et al. 2012). Italian hospital physicians’ answers, however, were close to those of the experienced physicians in this study (Flotta et al. 2012).

The factors that predisposed physicians to medical errors differed slightly between the younger and experienced physicians. The experienced physicians found consultations with nurses or colleagues, while seeing a patient, more important than the younger physicians. This is consistent with the results of previous studies (Saura Llamas et al. 1997).

The factors that helped to avoid medical errors were perceived similarly by the younger and the experienced physicians. The only significant difference was that electronic databases were more favoured by the younger physicians when they tried to avoid medical errors. This is consistent with the results of prior studies (Chiu et al. 2009).

6.6. Professionalism and the work of a GP

The fifth-year students seemed to be fairly aware of the responsibilities of a GP when ranking high
the entities “health promotion”, “responding to patients’ health needs and concerns” and “care of chronic diseases” on their list of the most important aims in a GP’s work. They also found the comprehensive doctor–patient relationships to be an attractive feature in a GP’s work. Looking at the results against CanMEDS competencies (www.royalcollege.ca), the students seemed to have already addressed the ideas of “medical expert” and “communicator”. They were also already aware of the CanMEDS definitions “manager” and “health advocate”. Many of the students, however, believed that the most important goal of a GP’s work is to identify patients with serious disorders, and to refer these patients for specialized care, rather than to take care of chronic diseases. This may reflect the ideas they have learned from their hospital-based courses during previous study years.

The second and third studies probing the 5th-year medical students’ pre-existing attitudes towards a GP’s work revealed the following: too hasty, pressing and lonely work. These findings are in line with those in prior studies (Dowell et al. 2000, Simoens et al. 2002, Van Ham et al. 2006, Manca et al. 2007, Kruschinski et al. 2011). However, medical students in the U.S. from years one to four were of the opinion that time pressures did not affect primary care physicians very much when dealing with their patients (Phillips et al. 2012). The third feature that the 5th-year medical students (especially the males) chose as unattractive in their ranking list was too much dealing with non-medical problems. This is in line with the results of previous studies (Kruschinski et al. 2011).

The most attractive features of a GP’s work according to the 5th-year students were: it is versatile and challenging; it includes comprehensive doctor–patient relationships; and it offers opportunities to meet people of different ages. This is consistent with the results of prior studies (Jordan et al. 2003, Scott et al. 2007).

6.7. Conclusions

Thematic content analysis of the 3rd- to 4th-year students’ learning diaries showed that they were dealing with uncertainty from multiple dimensions. The results also revealed that their tolerance of uncertainty began to develop during the first clinical year, mainly during the last quarter.

In the cross-sectional survey 22% of the 5th-year medical students reported remarkable difficulty in tolerating uncertainty and 86% reported some fear of making medical errors when working as a locum resident, even if they claimed they tolerated uncertainty well or quite well. Poor tolerance of uncertainty was associated with female gender and thinking that a GP’s work includes too much responsibility.

The attractive features of a GP’s work from the same cross-sectional survey, according to the students, were that the work is versatile and challenging, offering long-term and comprehensive doctor–patient relationships. The unattractive features were that the work is pressing, lonely and a GP has to deal with too many non-medical problems.

The electronic questionnaire study exploring physicians working in primary healthcare showed that the younger physicians (work experience ≤5 years) tolerated uncertainty more poorly than the
experienced physicians (work experience >5 years). The experienced physicians were significantly more prone to find consultations with colleagues or nurses as a factor predisposing them to medical errors in comparison with the younger physicians. The younger physicians used electronic databases more often than the experienced physicians in order to avoid medical errors. In logistic regression, being a specialist in general practice was associated with good tolerance of uncertainty (adjusted OR 11.4), whereas feeling emotionally drained by work was associated with poor tolerance of uncertainty (adjusted OR 0.15). No significant associations were found as regards gender, physician’s age or fear of medical errors.

6.8. New information and recommendations

Students’ and physicians’ views of tolerance of uncertainty have not previously been studied to this extent. This is also the first study to explore (using the same questions) student doctors’ and younger and experienced physicians’ experiences of uncertainty. The connection between uncertainty and fear of making a medical error has not previously been studied very much either. In addition, the medical students’ perceptions of a GP’s work have not received much attention earlier. The present studies confirm the previous hypotheses that tolerance of uncertainty and coping with medical errors are highly important issues in general practice. The findings may also direct future studies on how to support and guide medical students and young doctors so that they could cope better when working in primary health care.

There was a strong association between the fifth-year medical students’ poor tolerance of uncertainty, and fear of making a medical error, which can be taken into consideration when supporting their development during the sixth year before graduation. The attitudes of the fifth-year medical students towards a GP’s work showed that they have both correct and incorrect assumptions of a GP’s work when attending their main courses in primary health care and this information can be used in the future to develop teaching before that phase.

Specific courses on how to deal with mistakes, how to prevent them from happening and where to seek help when a mistake has been made could prove themselves useful. In the long run medical errors can probably never be fully eradicated, but knowledge of their roots, physicians’ attitudes and coping skills will certainly help prevent as many of them as possible. At the same time knowledge of their roots may make physicians more prepared, and also help them to cope with mistakes when they do happen.

7. Implications for future studies

Further information could be gained by conducting a prospective study of cohorts of medical students beginning from the 1st year to their early years in primary care. This kind of study could provide information on the true developmental path of how medical students learn to cope with uncertainties and medical errors.
Courses organized on the themes of uncertainty, medical errors and professionalism should be carried out as intervention studies, using intervention and control groups, to ensure effective means of coping with uncertainty, reducing medical errors and supporting the development of professionalism.
8. Acknowledgements

I would like to express my sincere thanks to both of my supervisors, Professor Kaisu Pitkälä and docent Liisa Kuikka. Without the help from both of them I would not have been able to develop into the researcher I notice I have become now.

The inspiring commentaries and advice from Kaisu were of crucial importance in the process that finally led to this book of doctoral thesis. She is an extremely knowledgeable and experienced researcher as well as a wise and insightful person apart from being a colleague with long clinical experience from several fields of medicine. She also arranged the financing that I could receive my monthly salary at the institution in order to be able to continue with my research work.

The shared teaching experiences had already paved way for the productive co-operation with Liisa during the several years working at the University. She is a highly competent researcher and clinician who helped me to gather material to the research, acted as a supporting critic as well as a sounding board at times when needed.

I learned a lot of useful things from both of them that I could make use of in the future when I hope to continue doing research in a smaller scale.

I would also like to express my gratitude to the colleagues Professor Johan Eriksson, clinical teacher Lena Sjöberg-Tuominen, adjunct professor Arja Helin-Salmivaara, clinical teacher Helena Karppinen, former clinical teacher, Ph.D. Pirkko Salokekkilä, Professor Helena Liira and clinical teacher Martina Torppa for their participation in this research process. All their contributions have been valuable.

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The text quality of the thesis was much improved by the professional corrections and comments by Mr. Nick Bolton, to whom I owe special thanks for the language check. I also want to express my gratitude to Professor Sirkka Keinänen-Kiukaanniemi and Professor Matti Korppi for their expertise in the review process and for their valuable comments in order to improve this thesis.

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9. References


The curriculum of medicine at the University of Helsinki is available at the address: www.med.helsinki.fi -> in English -> Basic studies -> Studies ->Medical Education -> Curriculum in English (only the part of specialist education in is fully in English)


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10. Appendices

Survey for fifth year medical students

Hyvä L5-kurssilainen,

Oheisen kyselyn on tarkoitus virittää Sinut yleislääketieteen ja perusterveydenhuollon kurssille. Vastaa oheisiin kysymyksiin valitsemalla lähinnä omaa käsitystäsi oleva vaihtoehto. Monet kysymyksistä selvittävät mielipiteitä, joten niihin ei ole yhtä yksiselitteistä vastausta.

Taustatiedot:


1. Ikä (vuosia): _______ Kyselyn vastauspvm: pv _____ kk _____200__
2. Sukupuoli:
   ☐ Mies
   ☐ Nainen
3. Kuinka monta kuukautta olet toiminut lääkärintyössä ________kk
   Millä erikoisaloilla ja missä? _______________________________________
4. Aseta yleisyysjärjestykseen suomalaisten tärkeimmät kuolinsyyt
   _____Tapaturmat, liikenneonnettomuudet
   _____Syövät
   _____Alkoholi
   _____Sydän- ja verisuonitaudit
   _____Infektiot
   _____Mielenterveysongelmat
5. Preventiolla ja perusterveydenhuollolla on ollut tärkeä rooli suomalaisten eliniän pidentymisessä. Missä syyluokissa perusterveydenhuollossa toteutetulla preventiolla on mielestäsi ollut suurin rooli suomalaisten eliniän pidentymisessä? Aseta alla olevat syyluokit tärkeysjärjestykseen (1-6).
   _____Tapaturmat, liikenneonnettomuudet
   _____Syövät
   _____Alkoholi
   _____Sydän- ja verisuonitaudit
   _____Infektiot
   _____Mielenterveysongelmat
6. Kun ajattelet terveyskeskuslääkärin työtä, mitkä ovat mielestäsi seuraavista perusterveydenhuollon tärkeimpia tehtäviä (numeroi tärkeysjärjestykseen):
   _____Sairauksien väestötason seulonta erilaisin testein
   _____Sairauksien ensihoito
   _____Väestön ”pikkusairauksien” (esim. flunssa) hoito
   _____Väestön päivystysluonteisten sairauksien hoito
   _____Väestön terveyshuoliin vastaaminen
7. Tuleeko yleislääkärin mielestäsi olla suhteessa pitkääikaissairautta sairastavaan potilaaseen

☐ Auktoriteetti, joka suunnittelee hoidon ja kertoo potilaalle miten tämän tulee toimia
☐ Asiantuntija, joka kertoo elämäntapaohjeet ja perustustee potilaalle miksi näin kannattaa toimia
☐ Ammattilainen, joka selvittää potilaan arkielämää, neuvottelee potilaan kanssa tämän elämäntavoista ja antaa ensisijaisen vastuun potilaalle hoidosta
☐ Ammattilainen, joka pyrkii yhdessä potilaan kanssa suunnittelemaan elämäntapamuutoksia ja räätälöimään hoitoja
☐ Valmentaja, potilaan rinnalla kulki, joka hyväksyy potilaan elämäntavat ja pyrkii räätälöimään hoidot mahdollisimman pitkälle potilaan tavoitteiden mukaisiksi

8. Paljonko suomalaisen yhteiskunnan terveydenhuoltoon osoitetuista varoista menee seuraaviin

Erikoissairaanhoidoille ________ %
Avohoidoille ________ %
Pitkääikaisten laitoshoidolle ________ %

9. Mitkä seuraavista olisivat kohdallaasi houkuttelevimpia yleislääkärin työn piirteitä, joiden takia voisit kuvitella hakeutuvasi perusterveydenhuoltoon töihin (nimeä numeroilla viisi tärkeintä tallaista piirrettä tärkeysjärjestyksessä)

☐ Pitkät potilassuhteet
☐ Haasteellinen, monipuolinen työ
☐ Potilassuhteiden kokonaisvaltaisuus
☐ Ikkuna tavallisen ihmisen arkeen ja elämään
☐ Perheiden, yhteisöjen sairastamisen ja voimavarojen ymmärtäminen
☐ Mahdollisuus tavata kaikenikäisiä, erilaisia ihmisiä
☐ Työ palkitsevaa, potilaat kiitollisia
☐ Hyvä palkka
☐ Turvallinen ja arvostettu työpaikka
☐ Muu, mikä? ____________________________

10. Mitkä seuraavista kommentteista olisivat yleislääkärin työhön liittyen niitä asioita, jotka saavat sinut miettimään yleislääkärin työn mielekkyyttä kohdallasi (nimeä numeroilla viisi haastavinta piirrettä tärkeysjärjestyksessä)

☐ Pitkät potilassuhteet, myös moniongelmaisten ja vaativien potilaiden kohdalla
☐ Liian haasteellinen, vaikea työ
☐ Vastuu liian suuri
☐ Työ liian arkista, tylsää
☐ Työ ulottuu liaksi sairauksien hoitamisen ulkopuolelle
☐ Työ liian pakkotahtista, vaikeasti hallittava
☐ Huono palkka
☐ Työ yksinäistä verrattuna sairaalalääkärin työhön
☐ Vaikeus edetä uralla
☐ Virheiden tekemisen pelko
☐ Muu, mikä? ____________________________
11. Mikä mielestädäsi olisi kohdallasi sopiva yleislääkärin potilasvastaanoton kesto tavallisella päivävastaanotolla _______ minuuttia

12. Entä yleislääkäritasoisessa päivystykessä? _______ minuuttia

13. Kuinka monta potilasta arvioisit pystyväsi vastaanottamaan päivän aikana terveyskeskusslääkärinä (vastaanottotyötä, ei päivystystä)? _______ potilasta

14. Kuinka suuri osa arviosi mukaan yleislääkärin pitkäaikaissairauksia sairastavista potilaista käytyä lääkkeitä kuten lääkäri on ne määrittänyt? _______ %

15. Jos toimit 2000 asukkaan väestön omalääkärinä ja oletamme, että vastuuväestösi työikäisistä 70% käy ensisijaisesti sinun vastaanottolasi ja vanhusikaista arviolta 100%, kuinka monta tapaus sinun tulisi keskimäärin löytää/diagnostisoita väestöstäsi vuodessa seuraavia sairauksia:
   - _______ uusia syöpätapauksia
   - _______ uusia dementiaa sairastavia
   - _______ uusia astmatapauksia
   - _______ uusia sepelvaltimotausta sairastavia

16. Kuinka monen koronaaritautia sairastavan potilaan hyperlipidemia tulee hoitaa hyvin, jotta pystyisit estämään yhden sydäninfarktin viiden seuraavan vuoden aikana _________

17. Kuinka mona TIA-kohtauksista ja flimmereistä kärsineitä potilaita tulee hoitaa warfariinilla hyvin, jotta voit estää yhden aivohalvauksen vuodessa. _________

18. Pelkäätkö tekeväsi virheitä lääkärin työssä?
   - Kyllä
   - En
   - En ole ajatellut

19. Jos tekit virheen lääkärin työssä, mitä tekit (voit valita useita vaihtoehtoja)?
   - Pyrkisin, jos mahdollista, peittämään sen
   - Kertoisin siitä esimiehelleni
   - Kertoisin siitä potilaalle ja selittäisin miksi niin tapahtui
   - Kertoisin siitä potilaalle ja pyytäisin anteeksi
   - Pyrkisin etsimään syytä työyhteisöstä

20. Millaiseksi arvioit oman suhtautumisesi epävarmuuteen lääketieteellisissä päätöksentekotilanteessa?
   - Minun on vaikea sietää epävarmuutta diagnostiikan ja/ tai hoitopäätöksien suhteen
   - Pystyn sietämään kohtalaisesti epävarmuutta diagnostiikan ja/ tai hoitopäätöksien suhteen
   - Pystyn sietämään hyvin epävarmuutta diagnostiikan ja/ tai hoitopäätöksien suhteen
21. Millainen mielestäsi itse olet lääkärinä?
- Auktoriteetti, joka suunnittelee hoidon ja kertoo potilaalle miten tämän tulee toimia
- Asiantuntija, joka kertoo elämäntapaohjeet ja perustelee potilaalle miksi näin kannattaa toimia
- Ammatilainen, joka selvittää potilaan arkielämää, neuvottelee potilaan kanssa tämän elämäntavoista ja antaa ensisijaisen vastuun potilaalle hoidosta
- Ammatilainen, joka pyrkii yhdessä potilaan kanssa suunnittelemaan elämäntapamuutoksia ja räätälöimään hoitoja
- Valmentaja, potilaan rinnalla kulkuja, joka hyväksyy potilaan elämäntavat ja pyrkii räätälöimään hoidot mahdollisimman pitkälle potilaan tavoitteiden mukaisiksi

22. Kun menet ensi kertaa perusterveydenhuoltoon ja toimit yleislääkärinä, mitä tukea toivot työpaikaltasi (valitse kolme tärkeintä)?
- Mahdollisimman hyvät nettyyhteydet, jotta voin hakea tarvittaessa tietoa
- Mahdollisimman kattavan kirjaston, josta hakea tietoa
- Oman tutorlääkärin, jolta voi kysyä kun en tiedä enkä osaa
- Harvan, omalle itselle sopivan potilasfrekvenssin
- Joustavan työajan
- Hyvän palkan
- Hyvän työyhteisön joka ymmärtää nuoren lääkärin tarpeita
- Muuta, mitä ________________________________________________

23. Mitä koet suurimmaksi haasteiksi terveyskeskulääkärin työssä?
___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________

24. Mitä osa-alueita on heikosti käsiteltynä opiskeluaikana, joita arvoinit tarvitsevaksi terveyskeskulääkärin työssä
___________________________________________________________________________________
___________________________________________________________________________________
___________________________________________________________________________________

25. Mitä aiheita toivot käsiteltävän tulevan kevään ryhmäopetuksissa:
___________________________________________________________________________________
___________________________________________________________________________________

26. Millaisiksi koet omat valmiutuesi tehä terveyskeskulääkärin työtä (ympyrői lähin vaihtoehto)?
1 erittäin heikoaksi  2 melko heikoaksi  3 en osaa sanoa  4 melko hyviksi  5 erittäin hyviksi
Kysely

Vastaajan perustiedot:
1. Sukupuoli:
   - Mies
   - Nainen
2. Syntymävuosi: ________
3. Syntymämaa
   - Suomi
   - Muu, mikä? ________________
4. Äidinkieli
   - suomi
   - ruotsi
   - muu, mikä? ________________
5. Siviilisääty
   - naimisissa/avoliitossa
   - eronnut
   - leski
   - yksineläjä
6. Valmistunut lääkäriksi, vuonna: _________
7. Mistä yliopistosta? __________________
8. Kuinka pitkään olet toiminut lääkärinä kliinisessä lääkärintyössä?
   ________vuotta _________kuukautta
9. Olen (merkitse rastilla, mikä pitää paikkansa)
   a. suorittamassa ns. eurovaiheen (PTL-) palvelua
   b. muu lääkäri perusterveydenhuollossa, en ole erikoistunut
   c. yleislääketieteen erikoislääkäri
      erikoistuin vuonna ________________
   d. muun alan erikoislääkäri
      mikä/mitkä? ____________________
      erikoistuin vuonna ________
10. Nykyinen toimenkuvasi (voit valita useita vaihtoehtoja):
    Kliininen työ ______
Hallinto

Opetus, ohjaus

Tutkimus

Muu: mikä?

11. Jos teet kliinistä työtä, mitä seuraavista (voit valita useita vaihtoehtoja):

Tavallinen päivävastaanotto

Päiväpäivystys

Ilta-yöpäivystys

Neuvola (lasten-, äitiys, ehkäisy)

Kotihoito

Vuodeosasto

Palvelutalo, vanhainkoti tms.

Muu, mikä? ___________________________________________________

Kysymykset:

12. Millainen olet mielestäsi lääkärinä potilastyössä?

☐ Auktoriteetti, joka suunnittelee hoidon ja kertoo potilaalle miten tämän tulee toimia

☐ Asiantuntija, joka antaa tietoa sairaudesta ja hoidosta sekä perustelee potilaalle miksi näin kannattaa toimia

☐ Ammattilainen, joka pyrkii yhdessä potilaan kanssa suunnittelemaan ja räätälöimään hoitoja

☐ Valmentaja, potilaan rinnalla kulkuja, joka hyväksyy potilaan elämäntavat ja pyrkii räätälöimään hoidot mahdollisimman pitkälle potilaan tavoitteiden mukaisiksi

13. Mitkä ovat mielestäsi seuraavista perusterveydenhuollon tärkeimmä tihtävää (numeroi tärkeysjärjestykseen mielestäsi 5 tärkeintä 1 tärkein, 5 vähiten tärkeä):

☐ Sairauksien väestötason seulonta erilaisin testein

☐ Sairauksien ensihoito

☐ Väestön ”pikkusairauksien” (esim. flunssaa) hoito

☐ Väestön päivystysluonteisten sairauksien hoito

☐ Väestön terveyshuoliin vastaaminen

☐ Väestön vaikeiden sairauksien tunnistaminen ja lähettäminen

erikoissairaanhoitoon

☐ Kroonisten sairauksien sekundaaripreventio, seuranta, hoito

☐ Väestön terveyden edistäminen ottaen huomioon yhteisön ja perheiden sairastaminen

14. Oletko tehnyt virheitä kliinisessä potilastyössä viimeisen vuoden aikana?

KYLLÄ EI
15. Oletko ollut viimeisen vuoden aikana huolissasi siitä, että olisit tehnyt virheitä kliinisessä potilastyössä?  
KYLÄ  EI  
________  _______  

16. Oletko tehnyt virheitä kliinisessä potilastyössä viimeisen kolmen kuukauden aikana?  
KYLÄ  EI  
________  _______  

17. Oletko ollut viimeisen kolmen kuukauden aikana huolissasi siitä, että olisit tehnyt virheitä kliinisessä potilastyössä?  
KYLÄ  EI  
________  _______  

18. Ajatteletko joskus valituksen, kanteen tai syytteen kohteeksi joutumista?  
KYLÄ  EI  
________  _______  

19. Pelkäätkö virheiden tekemistä lääkärin työssä?  
☐ Kyllä  
☐ En  
☐ En ole ajatellut asiaa tarkemmin  

20. Jos/kun olet tehnyt virheitä työssäsi, mitä olet tehnyt (voit valita useita vaihtoehtoja)?  
☐ Olen pyrkinyt peittämään sen  
☐ Olen kertonut siitä esimiehellen tai työtövereilleni  
☐ Olen kertonut siitä potilaalle ja selittänyt miksi niin tapahtui  
☐ Olen kertonut siitä potilaalle ja pyytänyt anteeksi  
☐ Olen pyrkinyt etsimään syytä työyhteisöstä  
☐ Olen käsitellyt asiaa muulla tavalla, miten ____________________________  

22. Arvioi, miten tyytyväinen olet työhösi tällä hetkellä (rastita oheiselle janalle oma arviosi):  

<table>
<thead>
<tr>
<th>Erittäin tyytymätön</th>
<th>Erittäin tyytyväinen</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I</td>
<td>I</td>
</tr>
</tbody>
</table>

23. Arvioi, miten tyytyväinen olet elämääsi tällä hetkellä (rastita oheiselle janalle oma arviosi):  

<table>
<thead>
<tr>
<th>Erittäin tyytymätön</th>
<th>Erittäin tyytyväinen</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>I</td>
<td>I</td>
</tr>
</tbody>
</table>
24. Millaiseksi arvioit oman suhtautumisen epävarmuuteen lääketieteellisessä päätöksentekotilanteessa?

☐ Minun on vaikea sietää epävarmuutta diagnoosi- ja/tai hoitopäätöksien suhteen
☐ Pystyn sietämään kohtalaisesti epävarmuutta diagnoosi- ja/tai hoitopäätöksien suhteen
☐ Pystyn sietämään hyvin epävarmuutta diagnoosi- ja/tai hoitopäätöksien suhteen

26. Miten seuraavat tekijät tukevat sinua virheiden välttämisessä?

Arvioi seuraavalla skaalalla 1=ei merkitystä, 2=tukee hiukan, 3=tukee jossain määrin, 4=tukee paljon

<table>
<thead>
<tr>
<th>Konsultaatiot oman työpisteen kollegoiden kesken</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erikoissairaanhoidon/toisen erikoisalan konsultaatiot</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Täydennyskoulutus sisäisinä tai ulkoisin koulutuspäivinä tai verkkokoulutuksena ja/tai ammattikirjallisuus, esim. Lääkärilehti, Duodecim tai ulkomaiset lehdet</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Terveysportti tai muut sähköiset tietokannat</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Kliininen kokemus</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

34. Koetko joitakin potilaisiin tai työympäristöön liittyviä tekijöitä, jotka lisäävät mielestäsi virheen mahdollisuutta? (Voit valita useamman vaihtoehdon)

☐ Hoitajien tai kollegoiden konsultaatiot kesken vastaanoton
☐ Puhelut kesken vastaanoton
☐ Kiireinen työtahti vastaanoton
☐ Vaativa potila
☐ Potilaan omainen on läsnä vastaanoton
☐ Jokin muu seikka, näkä?

Kiitos vastauksistasi!
Frågeformulär
Tolerans av osäkerhet och rädsla för att göra misstag, för euroläkare och deras handledare

Bakgrundsinformation:

1. Kön:
   - Man
   - Kvinna

2. Födelseår: _______

3. I vilket land är du född?
   - Finland
   - Något annat land, vilket? _____________

4. Modersmål
   - svenska
   - finska
   - annat, vilket? _________________

5. Civilstånd
   - gift, samboende
   - fränskild
   - änka/änkling
   - ensamstående

6. Blivit färdig läkare, när? _______

7. Från vilket universitet? _________________

8. Hur länge har du varit verksam som läkare i det kliniska patientarbetet? ______ år ______ månader

9. Jag (sätt ett kryss för det som gäller)
   a. håller på med euroläkartjänstgöring (är ST-läkare)
   b. är en mer erfaren läkare på en hälsovårdscentral, jag har inte specialiserat mig
   c. är specialist i allmänmedicin, blev specialist år ______
   d. specialist i någonting annat

   Vilken specialitet? ______________________
   Jag blev specialist år ______

10. Dina nuvarande arbetsuppgifter är (du kan välja flera alternativ):
    - Kliniskt patientarbete ____
    - Administration ____
    - Arbetar som lärare eller handledare ____
    - Forskar ____
    - Annat, vad? _________________________________________

11. Om du är i kliniskt patientarbete, vilken eller vilka av de följande sysslar du med?
    - Tidsbeställningsmottagning ____
    - Dagjournmottagning ____
    - Kvällsjour eller nattjournmottagning ____
    - Rådgivningsarbete (barn, mödrar, preventiv) ____
    - Hemvård/hemsjukvård ____
    - Avdelningsarbete ____
    - Serviceboende, äldringshem eller dylikt ____
    - Annat, vad? _________________________________________
Frågorna:

12. Hurdan är du enligt ditt tycke i patientarbetet som läkare?
   ☐ En auktoritet som planerar behandlingen och berättar för patienten hur hon eller han ska göra
   ☐ En sakkunnig som ger patienten information om sjukdomen och behandlingen och motiverar för patienten varför man borde göra på det sättet som läkaren föreslår
   ☐ En expert som tillsammans med patienten försöker skräddarsy behandlingarna
   ☐ En tränare som går vid patientens sida och accepterar hennes eller hans levnadsvanor och försöker skräddarsy behandlingarna så långt som möjligt enligt patientens önskemål

13. Vilka av de följande är enligt ditt tycke de viktigaste uppgifterna för primärvården? (Välj de fem viktigaste och numrera dem från 1 till 5; 1 är den viktigaste och 5 är den minst viktiga.)
   ☐ Sällning av populationen med olika tester
   ☐ Behandling av sjukdomar i begynnelsestadiet
   ☐ Behandling av "lindriga sjukdomar" hos populationen
   ☐ Behandling av brådskande sjukdomar på akuten
   ☐ Att besvara hälsorelaterade frågor som populationen har
   ☐ Att kunna identifiera svåra sjukdomar i populationen och skicka sådana patienter till specialistvård
   ☐ Sekundär prevention, uppföljning och behandling av kroniska sjukdomar
   ☐ Hälsofrämjande av populationen inklusive sjukdomar i samhället och hos familjer

14. Har du upptäckt att du begått misstag under det pågående året i det kliniska patientarbetet?

   JA ☐ NEJ ☐

15. Har du varit orolig under det pågående året för att du skulle ha begått misstag i det kliniska patientarbetet?

   JA ☐ NEJ ☐

16. Har du upptäckt att du begått misstag under de senaste 3 månaderna i det kliniska patientarbetet?

   JA ☐ NEJ ☐

17. Har du under de senaste 3 månaderna varit orolig över att du skulle ha begått misstag i det kliniska patientarbetet?

   JA ☐ NEJ ☐

18. Tänker du någon gång på det att du skulle kunna råka ut för en reklamation, ett käromål eller ett åtal?

   JA ☐ NEJ ☐

19. Är du rädd för att begå misstag i samband med läkararbetet?

   ☐ Ja
   ☐ Nej
   ☐ Jag har inte tänkt på det desto mera

20. Om/när du har begått ett misstag, vad har du gjort sedan? (Du kan välja fler alternativ.)

   ☐ Jag har försökt dölja det
   ☐ Jag har berättat om det till min chef eller till mina arbetskompisar
   ☐ Jag har berättat om det till patienten i fråga och förklarat varför det hände
   ☐ Jag har berättat om det till patienten i fråga och bett om ursäkt
   ☐ Jag har försökt att leta efter orsaken i arbetsgemenskapen
   ☐ Jag har bearbetat det på ett annat sätt, hur? _________________________
22. Hur nöjd du är med ditt arbete för tillfället? (sätt ett kryss på det lämpliga stället på nedanstående linje)

Mycket missnöjd                Mycket nöjd
0 1 2 3 4 5 6 7 8 9 10
I_______I_______I_______I_______I_______I_______I_______I_______I_______I_______I

23. Hur nöjd du är med ditt liv för tillfället (sätt ett kryss på det lämpliga stället på nedanstående linje)

Mycket missnöjd                Mycket nöjd
0 1 2 3 4 5 6 7 8 9 10
I_______I_______I_______I_______I_______I_______I_______I_______I_______I_______I

24. Hurdan är din attityd gentemot osäkerhet när du fattar medicinska beslut?

☐ Jag har svårt att stå ut med osäkerhet i samband med diagnostik och/eller behandlingsbeslut
☐ Jag har ganska lätt att stå ut med osäkerhet i samband med diagnostik och/eller behandlingsbeslut
☐ Jag tål väl osäkerhet i samband med diagnostik och/eller behandlingsbeslut

26. Hur anser du att de följande alternativen stöder dig när du försöker undvika att begå misstag?

Värdera de följande frågorna angående hur de stämmer på dig på skalan, 1=har ingen betydelse, 2=stöder lite, 3=stöder i viss mån, 4=stöder bra

Konsultationer mellan kollegerna på den egna arbetsplatsen
1 2 3 4
Konsultationer av specialistsjukvården eller en annan specialitet
1 2 3 4
Vidareutbildning i form av interna eller externa kursdagar eller som internetkurs och/eller yrkesrelaterad litteratur, t.ex. Läkartidningen, Duodecim eller utländska tidningar
1 2 3 4
Terveysportti eller andra elektriska källor av information
1 2 3 4
Klinisk erfarenhet
1 2 3 4

34. Anser du att det finns saker som är relaterade till patienterna eller till arbetsplatsen som ökar enligt ditt tycke risken för att begå ett misstag? (Du kan välja flera alternativ)

☐ Sköterskor eller kollegor konsulterar mitt i mottagningen
☐ Telefonsamtal mitt i mottagningen
☐ Brådska på mottagningen
☐ Krävande patient
☐ Patientens anhörig är också på mottagningen
☐ Någonting annat, vad? ____________________________________________

Tack för dina svar!
11. Original publications
Medical Education

Facing uncertainty as a medical student—A qualitative study of their reflective learning diaries and writings on specific themes during the first clinical year

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1. Introduction

Uncertainty in the medical work and decision-making is a well-known theme for all doctors. It has been discussed in medical literature from several perspectives, and there are various approaches to investigate uncertainty (Table 1). There have been expectations that evidence-based medicine, and guidelines for management of diseases would standardize clinical care, and limit the variability and uncertainty related to medical decision making [1–3]. However, several authors argue that there always will be a certain amount of uncertainty in medicine [4,5]. Some papers have focused on exploring physician and patient related factors causing uncertainty in medical decision making [3,6]. In addition, physicians’ strategies to cope with and to reduce uncertainties in medicine have been studied among GPs but less is known about how medical students develop tolerance of uncertainty during their studies. The aim of this study was to investigate how the medical students experience uncertainty during their first clinical years and how their feelings develop with time as they progress from the 3rd year to the 4th year.

Methods: The material consisted of 22 students’ reflective learning diaries and writings on specific themes collected during the 3rd and 4th year of their medical studies. The analysis was performed using thematic content analysis. In this article we present the results related to the theme of uncertainty.

Results: Uncertainty is a major cause of mental strain for medical students, particularly fear of making mistakes. Main themes related to facing uncertainty and found in the diaries and writings were insecurity of professional skills, own credibility, facing with the inexactness of medicine, fear of making mistakes, coping with responsibility, and tolerating oneself as incomplete and accepting oneself as a good-enough doctor-to-be. Common steps of development towards tolerance of uncertainty were found in diaries over a one-year time period as the students progressed in their clinical studies.

Conclusions: Reflective writing showed to be an effective means for the students of both expressing and dealing with uncertainty, both with the difficult and the pleasant feelings and the experiences the students had with their first patient contacts. It also gave some of them the means of self-reflection which they afterwards found worthwhile.

Practice implications: Reflective writing is powerful tool which medical students could use to facilitate their maturation process what comes to uncertainty during their first clinical year.

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Table 1
Approaches to explore uncertainty in Medicine.

| (1) Limits in general medical knowledge always leave a certain level of uncertainty in diagnoses and management of diseases. There are growing expectations on Evidence-based Medicine and guidelines of care that they will reduce the level of uncertainty [1]. |
| (2) Physician and patient related factors causing uncertainty and variability in medical practice have been studied. Physician's and patient's communication skills; ability to speak common language, and to understand each other [22] Patients vary in their expression of symptoms and signs [7] Attitudes, values and demands related to diseases, care and medicine [7,10,15,21] Physician's knowledge, skills, experience [7,14,21,22,24,36] Haste in consultations, errors in interpretation [4,21,22] |
| (3) Physicians' strategies to cope with uncertainty have been studied. Patient-centered consultations, building partnerships, shared decision-making [3,6,10,13,14] Meticulous history taking, increased testing [3,6,7,21] Exclusion of worrisome diagnoses [3,6,9] Critical appraisal of current literature [2,11] Continuity of care and reassessments [6,7,9] |
| (4) Effects of physician's expressions of uncertainty to patient on his/her confidence Negative or positive effects [5,7,13,14] |
| (5) Physicians' experiences, reactions and feelings related to uncertainty Tolerance/intolerance [7,10,15,16,22] Anxiety, feelings of threat, or stress [6,7,17,19,36] Ignorance, denial [10,12–14,16,17] |

help them find their way to primary care [7]. Pilpel et al suggest that shared knowledge on uncertainty, also when it comes to instructors sharing their experiences with the younger students, may make the students cope better with eventual future mistakes, and help to reduce their frequency, too [23]. Some researchers have studied medical students' attitudes towards uncertainty with various scales. Simpson et al suggested with their small study of 31 medical students completing a scale measuring intellectual development that experience, while increasing, made the students at the same time accept better the role of uncertainty in medicine [24]. Medical sociologists have been interested in the idea of uncertainty in medicine, too [25]. Fox listed the three basic types of uncertainty that she encountered while studying the medical students: firstly: acknowledging the limitations in current medical knowledge, secondly: their incomplete or imperfect mastery of available knowledge, and thirdly: difficulty in distinguishing between personal ignorance or ineptitude, and the limitations of present medical knowledge [26]. According to her observational studies the tolerance for uncertainty develops for the medical students during the whole training process in the medical school [27]. On the other hand, some doctors have opposite point of view. For example, Atkinson suggested that doctors should instead be trained for certainty, not uncertainty [28].

Thus, uncertainty in medicine may be dealt with from a number of points of views. Uncertainty occurs and it is important in medical practice particularly in specialties like general practice. However, very little is known about the inner feelings and reflections of medical students, the stress related to uncertainty, how tolerance for it develops during the early years of the studies and further on towards graduation. Therefore, the aim of this study was to explore more thoroughly the experiences of young medical students related to uncertainty in medicine. Especially we investigated how the concept of uncertainty appears in the reflections in their learning diaries, and how their attitudes towards uncertainty develop over time.

2. Methods

An optional one-year portfolio course was arranged for medical students during their first clinical year. At the Helsinki University students start their first clinical year on spring term during their third year in the medical school, and finish their first clinical year in fall term during their fourth year in the medical school. The aims of the course for the students were to enhance reflective thinking and analyze their own learning needs in becoming a doctor; to analyze their own level of development when adopting a physician's role; and to become aware of their own strengths and where they still needed to develop as a medical student. At the same time students started their first clinical year, examined their first patients, and became acquainted with hospital culture. One of the authors (KHP) served as a tutor both in an internal medicine course and in a portfolio course for the entire year. The portfolio course included preparation of personal portfolios, which consisted of reflective learning diaries (about 1–4 pages, four to five times during the first half of the course every second week), writings on specific themes (about 1–4 pages, four to five times during the second half of the course every second week), logbooks, self-evaluations, and personal feedback from teachers. In addition, students participated in group discussions three times during the year, discussing themes that had arisen in their diaries and writings. Students spent approximately 20 h on preparing their portfolios during the course.

In this article we have analyzed the reflective learning diaries and writings on specific themes. These included 79 reflective learning diaries and 94 writings on specific themes altogether 356 pages.

The instructions given to the students on writing have been presented in the previous article by two of the co-authors [29]. The instructions given to the participants regarding reflective learning diaries were briefly as follows: Write your diary preferably immediately after the incident you intend to write about. Besides a description of the actual event, also try to reflect your thoughts and feelings from, for example, the following points of view: What did you learn or experience? What has been difficult or dubious in this learning situation or experience? What problems did you encounter in learning sessions with personnel, teachers, or your group? The specific themes included, for example, questions related to responsibility of being a doctor, qualities of a good doctor, hospital culture, doctor–patient relationship and experiences related to making mistakes. The students could choose their preferred themes.

2.1. Participants

Altogether 22 students participated voluntarily in the course. Students represent 69% of those (22/32) to whom the course was offered. Only KHP's own tutor groups in internal medicine were offered the voluntary course. These 32 students were randomly
assigned to KHP. The students did not differ from the other medical students (N = 132) assigned to the other teachers in respect to their age or gender. Four students participated solely in the first half of the course, thus only writing reflective learning diaries. Another four participated in only the second half of the course, thus only writing on specific themes.

2.2. Analysis

The entire data consists of students’ portfolios, semi-structured questionnaires, and recorded and transcribed group discussions. In this study we have only used the students’ reflective learning diaries and writings on specific themes to identify their inner experiences and reflections on these. This was an a priori decision as they proved to be the most interesting and representative part of the material for this article.

Analysis was performed using thematic content analysis [30,31]. All reflective learning diaries and writings on specific themes were systematically examined several times to identify emergent themes. Data was organized into codes and further into broader categories encompassing the initial codes. Each item was compared with the rest of the data to establish analytical categories (constant comparison) [31]. Reflective learning diaries and writings on specific themes were reviewed and coded independently by all authors to ensure reliability. In a few cases the authors had discussions to reach a consensus on differing concepts. The written material is abundant. We have limited the report only on concepts related to the theme of uncertainty. This material provided abundant inner reflections of students related to their feelings.

All the participants gave their informed consent. The study protocol was approved of by the local ethics committee.

3. Results

Of the 22 participants, 15 were women and 7 men. The age ranged from 20 to 24 years. Students wrote abundantly about various dimensions of uncertainty – both about feelings of insecurity, fear and anxiety, as well as about how to cope with these emotions. We found six separate dimensions related to how students elaborated uncertainty (Table 2).

3.1. Insecurity of professional skills

The first contacts with patients were full of feelings of insecurity concerning one’s own professional skills. Nearly all students wrote about these feelings.

A female student writes about her feelings and experiences after her first encounter with a patient: “The things that are connected with examining a patient are so numerous that they still are a complete mess in my head. One is trying to know by heart in some way things that one should ask [the patient] and do [to the patient], even if one should more use one’s common sense. Maybe with accumulating experience that will happen.”

3.2. Own credibility

The students collected information on what were the patients’ reactions in contact with them. They reflected over their credibility based on these reactions.

A female student shares her uncertainties after her third patient: “The things that are connected with examining a patient are so numerous that they still are a complete mess in my head. One is trying to know by heart in some way things that one should ask [the patient] and do [to the patient], even if one should more use one’s common sense. Maybe with accumulating experience that will happen.”

3.3. Inexactness of medicine

Students felt confused about the inexactness of medicine. They felt puzzled when comparing their own findings with the medical records.

A female student tells about her reflections over this topic as follows: “…I got quite a different picture from the patient’s history
than the one I got from the medical records. . . the patient denied having other medications [than antihypertensives] although the medical records stated the contrary. The patient said that she had suffered from a stroke 12 years ago, even though in the medical records (which I trust in this case) it was a year ago!"

3.4. Fear of making mistakes

Students were very much afraid of making mistakes when dealing with their patients.

A male student writes it as follows after participating in the groups discussions already nearly until the end: "...but this autumn I have come to realize that this knowledge should in fact be used one day to take care of real diseases in real people. My first thought was that I will certainly kill someone, just because I have not learnt something important."

3.5. Coping with responsibility

However, with time they slowly felt more confident with shouldering the responsibility of a doctor.

A female student writes about her development after the group discussions have almost come to an end, and a year has passed: "In the future I would need still more courage to win over my own uncertainty. Even if one was uncertain about one's knowledge, one can inspire confidence in a patient with one's convincing behavior."

Another female student writes after the group discussions have come to an end: "Even if there have been some attacks of 'uncertainty', however, this spring has reinforced 'my choice of career'."

3.6. Tolerating oneself as incomplete and accepting oneself as good-enough a doctor-to-be

At the end of the course students wrote how one has to tolerate oneself as incomplete and to accept oneself as good-enough a doctor-to-be.

A female student puts forward specially the theme uncertainty, and coping with it in already quite a mature way: "There really is uncertainty in me, and I suspect that it will always stay that way, and the only thing I can do about it is that I try to do my best . . . I think that most doctors are afraid of showing that they are uncertain (in relation to their patients and colleagues), because they think it maybe will weaken their professional credibility. As a thought I find this to be scary and hope that I myself am able to and dare admit my uncertainty in the future, too" as she is here telling about the controversies the students see in practicing medicine, and she is at the same time reflecting their fears.

A developmental pathway could be observed among the students during the clinical year. They matured from insecure young medical students to little by little test their credibility when facing their patients, to ponder over the controversies they saw in practicing medicine, as well as to fully consciously reflect over their fears. At the end they began gradually to cope with the increasing responsibility and to accept themselves as good-enough doctors to-be (Fig. 1).

4. Discussion and Conclusion

4.1. Discussion

Our findings show that uncertainty may be a major theme among many medical students' thinking during the first clinical year. It is also an important cause of mental strain for them as can be seen in their reflections on credibility, insecurity of professional skills and fear of making mistakes. Most of them developed in a positive direction during the year, and began to mature from uncertain students towards more certain medical doctors-to-be. Still their opinion on themselves stayed mostly realistic, and they realized that uncertainty will always be a part of a doctor's everyday work. But it does not need to overwhelm him or her. To put it simply, they became more capable of tackling their feelings, and reassuring themselves with time.

The studies investigating medical students' feelings about and tolerance of uncertainty in medicine are still scarce. Some researchers have suggested that the concepts of uncertainty and ambiguity related to medicine imply similar meanings [32]. Whereas uncertainty is defined as a fact or condition that lacks firm predictability, ambiguity refers to double meaning or inexactness of an expression [32]. DeForge and Sobal administered Tolerance for Ambiguity Scale [33] firstly to medical students prior to the beginning of their studies, and 6–9 weeks later and secondly to family practice residents of the first year [20,34]. They showed that the family practice residents were more intolerant than the medical students in the beginning of their studies. Geller et al. used the same scale and found that tolerance for ambiguity did not change over time in medical school [35]. These are contrary to our findings which suggest that the tolerance develops over time. The methods used in these studies are so different from ours that they cannot be reliably compared.

In accordance to prior studies, our study suggests that tolerance of uncertainty is a major issue in medicine [7,9-10,20–22]. Tolerance of uncertainty is considered to be an essential dimension of professional competence [36].

It is interesting that several themes covered in previous literature on uncertainty in medicine were covered in our medical students' diaries and writings: uncertainty of medical knowledge [1], strategies to cope with uncertainty [10,11], and feelings related to uncertainty [6,16] and finally tolerance of uncertainty [36]. In addition, students reflected abundantly on insecurity of their medical skills, their feelings on lack of credibility, as well as fears of making mistakes.

According to our study there seem to be similarities in the feelings of uncertainty regarding all the students, when they progress from the preclinical, mostly theoretical studies to more concrete encounters with patients. The way of expressing the feelings of uncertainty may vary considerably though from person to person. Some people at least in our study may not wish to deal with the topic at all on conscious level as can be seen in Table 2. At the same time all of the students are bound to develop at their own...
pace towards their ultimate goal, that of becoming a doctor. As our Fig. 2 on the maturation process suggests, the development is linked with dealing with uncertainty, and the different elements of it. The students seemed to develop into the direction of more mastery of their own feelings about, and perceptions of, uncertainty with time.

Reflective learning diaries and writings also showed to be one aid in the development what came to uncertainty. It has been suggested by Goldie et al. that portfolios are a good tool in facilitating young students’ process of learning [37]. In addition, group discussions and peer support may provide a safe means of discussing even more delicate topics like attitudes.

The small sample of students represented certainly the most interested and active part of the course, it is those who were especially willing and able to reflect over their feelings. However, they represented 69% of the students who were offered the voluntary course and these students were random sample of the whole medical student cohort. Anyway, the findings of our study may not be generalized to all medical students. A clear limitation is that the students were well aware of the fact that their teacher (KHP) would later on be reading their writings. This is why they could have censored themselves to some part, or even written in such a way that they believed that their teacher would expect them to write. Not all of these feelings may have been fully conscious. An important strength of this study was the richness of material from the students. Uncertainty was reflected many-sidedly and abundantly. We were impressed by the openness which the students showed when writing their reflections. In respect to development of tolerance for uncertainty the course seemed to be organized just at the right time. The turning point, when the students progress from the preclinical stage to the clinical stage in their studies, seems to be one of the most important steps for them in the light of this study. The very same transition from students who have never seen real patients to young student-doctors who have met their first patients also seems to be an important phase in their development towards future doctors, and accepting themselves as good-enough doctors-to-be.

4.2. Conclusions

Reflective writing may be a feasible means of both expressing and dealing with uncertainty. The students reflected on both the difficult and the pleasant feelings in them, and likewise the uncertainty related to the experiences with their first patient contacts. Self-reflection may have aided them in better developing tolerance of uncertainty during the first clinical year.

4.3. Practice implications

Various feelings of uncertainty related to the medical knowledge, insecurity in the physician’s role, as well as credibility, and fear of making mistakes may be common among the students during the medical studies. Reflective writing is a powerful tool in recognizing these experiences, and supporting professional development. It may help the students learn to cope with uncertainty, and also to tolerate themselves as incomplete. It may even help them to accept themselves as good-enough doctors-to-be in the end.

Conflict of interest

There are no conflicts of interest.

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References


Tolerance of Uncertainty and Fears of Making Mistakes Among Fifth-year Medical Students

Maarit Nevalainen, MD; Liisa Kuikka, MD, PhD; Lena Sjöberg, MD; Johan Eriksson, MD, PhD; Kaisu Pitkälä, MD, PhD

BACKGROUND AND OBJECTIVES: Tolerance of uncertainty is an important skill among general practitioners (GPs). Our aim was to study fifth-year medical students’ feelings related to facing uncertainty and fears of making mistakes in medical decisions. Further, we studied the associations of intolerance of uncertainty with demographic factors, the students’ fears of making mistakes, and their views of a GP’s work prior to their ultimate course in general practice.

METHODS: A questionnaire-based survey was carried out among the fifth-year medical students prior to their main course in general practice at the University of Helsinki. The questionnaire included demographic variables and inquired about their views of their own tolerance of uncertainty, fear of making mistakes, and of a GP’s work overall.

RESULTS: During the years 2008–2010, 307/359 medical students (mean age 25.7 years, 64% females) responded. Of the respondents, 22% felt they had difficulty tolerating uncertainty when making medical decisions. Females reported that they tolerated uncertainty poorly more often (27%) than did males (11%). Those tolerating uncertainty more poorly were more often afraid of making mistakes (100% versus 86%). This group more often considered a GP’s work too difficult and challenging than did others.

CONCLUSIONS: Poor self-reported tolerance of uncertainty among medical students is associated with considering a GP’s work too challenging.

(Fam Med 2012;44(4):240-6.)

Because students experience feelings of uncertainty from the very beginning of their studies and everything is new for them, they will face patients and even suffering. They also begin developing their own identities as doctors very early in the curriculum. As soon as they enter the clinical stages, they begin to realize that they are the ones who need to make the decisions and shoulder the responsibilities. The first clinical years are also a time when students become more fearful of making mistakes, when they realize the potential consequences of their mistakes. Sarikaya and colleagues found in their study that fear of making mistakes was the most important source of anxiety among medical students, poised to begin their first clinical year.

Tolerance of uncertainty is an important issue among new doctors, especially in general practice. According to Donner-Banzhoff, the broad range of unselected patients a general practitioner (GP) meets leads to a particularly heavy burden of uncertainty.

Some studies have shown that intolerance of uncertainty is related to avoidance of specialties such as family medicine, geriatrics, or psychiatry. Lieu and colleagues suggested that groups entering internal medicine, family medicine, pediatrics, and psychiatry (“personal care specialties”) were significantly older than groups entering technology-oriented specialties (e.g., different forms of surgery).

Some articles also report on varying characteristics associated with physicians’ feelings of uncertainty. For example, female doctors, junior doctors, surgical physicians/surgeons, generalists, and physicians with lower workloads show greater anxiety due to uncertainty. Uncertainty is associated with anxiety, stress,
and feelings of dread, as well as ignorance or denial. Medical students in Helsinki attend courses closely associated with general practice during the first year (observing family physicians’ practice for 1 week), second year (early patient contact in community care and students interview during 1 week people from varying age groups from small children to elderly people; several of the interviewees have faced various hardships in life), and third or fourth year of the curriculum (students hold their first patient consultations in primary health care, 1 week at a health center when they may have an opportunity to interview and examine patients on their own, and then a GP examines the patients afterward to ensure that everything has been covered). In general, the medical students in Finland have an opportunity to see and examine real patients from the beginning of their studies. Because of their practical studies, they are able to work as locum residents after their fourth year of medical studies.

The main course (5 weeks) in general practice takes place during the fifth year of medical studies. During this last course, students participate in some introductory lectures and group discussions on various themes, including, among others, the chronically ill patient, the patient with upper extremity pains and aches and back problems, and certificates in medicine. The topics include, for example: “What is the diagnostic process like that a GP uses in everyday work?” “The special features of a geriatric patient from a doctor’s point of view,” and “Tolerating uncertainty in everyday work.”

During this course, they perform a rotation for 2 weeks at different health centers (one to four students work at a specific health center) where they follow a program that includes at least the well-baby clinic and the maternity clinic. There they are allowed to examine some patients under the supervision of a GP. During 1 day they follow the specialist nurses on their rounds in home care. They also familiarize themselves with physiotherapy, occupational therapy, and other possible departments at the health center. In addition, the students examine some patients on their own and then present their assessments to a GP teacher with complete plans for eventual changes in medication, laboratory test suggestions, etc.

In our previous study, we found that uncertainty is a major cause of mental stress among medical students. In the study, two of the researchers from this group (KHP and MKN) examined several learning diaries written by medical students advancing from the third to fourth course of their medical studies. In the learning diaries, the students reflected on their experiences connected to their first patient encounters. Main themes related to facing uncertainty found in the students’ diaries were insecurity of professional skills, one’s own credibility, facing the inexactitude of medicine, fear of making mistakes, and coping with responsibility. Therefore, we aimed to test further how these qualitative findings can be generalized in a larger sample of medical students.

The main reason we chose to conduct a pre-rotation survey was that we sought to obtain information about the students’ experiences, wishes, and needs, and about what they found to be difficult or challenging. We were also curious to know what they felt they needed to learn more about before the rotation on their last course in general practice.

We also believe that it is important to direct the thoughts of fifth-year medical students toward general practice prior to their last course, as we are then better equipped with knowledge of their attitudes. Interest in family medicine as a career choice seems to have slowly waned among Finnish medical students over the last 10 years. Many Finnish health centers lack GPs or relatively few work at health centers, especially in North-Eastern Finland.

The aim of the present study was to investigate medical students’ feelings about facing uncertainty in medical decision making and feelings about making mistakes when working as a locum resident. Furthermore, we studied the associations of tolerance of uncertainty using demographic factors, the students’ fears of making mistakes, and their views of a GP’s work.

Design and Methods

An electronic survey/questionnaire was distributed to fifth-year medical students prior to their main course in general practice at the medical school of the University of Helsinki. The fifth year is the penultimate year of medical school in Finland, as the medical curriculum in Finland consists of 6 years of study. Fifth-year medical students in yearly cohorts from 2008 to 2010 participated. The survey was carried out to encourage the students to think about various questions related to the work of a GP and to activate the students to ponder the course in advance. The students responded anonymously. The questionnaire was piloted among 10 students and was found relevant and easy to understand and respond to. Questions concerning uncertainty and fear of making mistakes were drawn from our previous study. In this qualitative study, uncertainty and fear of making mistakes were major concerns among undergraduate medical students that tended to dissipate over the course of their studies. Thus, we sought to test in a larger student sample the prevalence of these concerns and feelings. The Planning Committee for Undergraduate Medical Education of the University of Helsinki approved our study.

Of the 359 medical students participating in the general practice course during the years 2008 to 2010, 311 responded to the questionnaire. Thus, the response rate was 86%. Variables in the survey included demographic factors and the students’ experiences working as a locum resident. In Finland, medical
students may, after their fourth year of study, work at a hospital during the holidays as a locum resident.

The questionnaire inquired about their views on how they felt about and tolerated uncertainty when having to make medical decisions (Table 1). Of those who responded, 307 answered the question concerning tolerance of uncertainty.

We chose to offer three alternatives in that question because offered only two alternatives it would have been much more difficult for the Finnish participants to choose between well versus poor. This way it was easier to also capture those who thought that they tolerate uncertainty quite well but not “very well.” We decided to combine in the final analyses the two alternatives mentioned in the previous sentence under the category “tolerating uncertainty quite well or well.”

Students were also asked about their fear of making mistakes (yes/no/I have not thought about it). In addition, the questionnaire included students’ views of a GP’s work. In addition, students were asked what they would do if they had made a mistake in their work (yes/no), and were given the following options: (1) I would try to hide it, (2) I would inform my supervisor, (3) I would tell the patient and offer an explanation, (4) I would tell the patient and apologize, and (5) I would try to attribute the error to my work community.

Table 1. Questions in the Students’ Survey Related to Tolerance of Uncertainty and to Attitudes Toward a GP’s Work

<table>
<thead>
<tr>
<th>Question</th>
<th>Ranking order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How do you evaluate your tolerance of uncertainty when making medical decisions?</td>
<td></td>
</tr>
<tr>
<td>a. I have difficulties in tolerating uncertainty in diagnostics and/or medical decision making.</td>
<td></td>
</tr>
<tr>
<td>b. I tolerate uncertainty quite well in diagnostics and/or medical decision making.</td>
<td></td>
</tr>
<tr>
<td>c. I tolerate uncertainty very well in diagnostics and/or medical decision making.</td>
<td></td>
</tr>
<tr>
<td>The groups b and c were combined in the final analyses (“Tolerating uncertainty quite well or well”) and compared with group 1 (“Tolerating uncertainty poorly”).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Which of the following would be for you the most attractive features in a GP’s work that could make you choose to work in primary health care? (Choose and put in a ranking list the features from the most to the least attractive with numbers from 1 to 5)</th>
<th>Ranking order</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Long-term doctor-patient relationships</td>
<td></td>
</tr>
<tr>
<td>B. Versatile, challenging work</td>
<td></td>
</tr>
<tr>
<td>C. Comprehensive doctor-patient relationships</td>
<td></td>
</tr>
<tr>
<td>D. A window into ordinary people’s everyday life</td>
<td></td>
</tr>
<tr>
<td>E. Opportunity to meet people of different age groups and various backgrounds</td>
<td></td>
</tr>
<tr>
<td>F. Rewarding work, grateful patients</td>
<td></td>
</tr>
<tr>
<td>G. Well-paid job</td>
<td></td>
</tr>
<tr>
<td>H. Secure and respected job</td>
<td></td>
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</table>

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<tr>
<th>3. Which of the following would be for you the most unattractive features in a GP’s work that make you rethink the possibility of working as a GP in the future? (Choose and put in a ranking list the features from the most to the least unattractive with numbers from 1 to 5)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Long-term doctor-patient relationships with demanding patients</td>
<td></td>
</tr>
<tr>
<td>B. Work too challenging and difficult</td>
<td></td>
</tr>
<tr>
<td>C. Too much responsibility</td>
<td></td>
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<tr>
<td>D. Work too routine and tedious</td>
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<tr>
<td>E. Too much dealing with nonmedical problems</td>
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<tr>
<td>F. Too hasty and pressing work</td>
<td></td>
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<tr>
<td>G. Poorly paid job</td>
<td></td>
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<tr>
<td>H. Work too lonely</td>
<td></td>
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<tr>
<td>I. Difficult to advance in one’s career</td>
<td></td>
</tr>
</tbody>
</table>

GP—general practitioner
Categorical variables are compared with the X² test or Fisher’s exact test, and non-normally distributed continuous variables are compared with the Mann Whitney U-test. P values <.05 are considered significant.

Results
The mean age of the students (n=307) was 25.7 years (SD=3.2), 64% (n=196) were females, and the average experience working as a locum resident was 3.2 months (range 0 to 240 months). Of the students, 22% (n=67) responded that they tolerate uncertainty poorly when making medical decisions. The mean age of the group tolerating uncertainty quite well or well was significantly higher (mean age 25.8 versus 25.3, P=.020), and they had been working as a locum resident for a significantly longer period of time (mean 3.6 months versus 1.9 months, P=.030) (Table 2).

Those tolerating uncertainty poorly were significantly more often afraid of making mistakes than were those tolerating uncertainty well (100% versus 86%, P=.0011).

When the students were asked what they would do if they had made a mistake in their work as a doctor, 84% (n=56) of those tolerating uncertainty poorly responded that they would tell their patients and apologize, whereas the corresponding figure among the students tolerating uncertainty well was 70% (n=168). The difference between the groups was significant (P=.027). A small number in both groups (3.0% and 2.1%, respectively (P=.66)) responded that they would try to conceal their mistake.

We further analyzed how students felt about a GP’s work based on how they felt about uncertainty. There were no differences between the two groups in how they felt about the attractive features of a GP’s work (Figure 1). The majority in both groups thought that the most attractive feature in a GP’s work is its challenging nature and versatility (ranked it as the first, second, or third important attractive feature); 78% (n=188) of those tolerating uncertainty well versus 69% (n=46) of those tolerating uncertainty poorly. The difference between the groups was not significant (P=.085).

A significantly larger number of students tolerating uncertainty poorly considered a GP’s work to be too difficult and challenging (ranked it as the first, second, or third important unattractive feature) than of those tolerating uncertainty well (48% (n=32) versus 20% (n=48), P<.001). A significantly larger number of the students tolerating uncertainty poorly also felt that a GP’s work contains too much responsibility than of those tolerating uncertainty well (27% (n=18) versus 13% (n=30), P=.0042). However, a significantly smaller number of the students tolerating uncertainty poorly felt that a GP’s work includes too much dealing with social problems than of those tolerating uncertainty well (40% (n=27) versus 57% (n=136), P=.018) (Figure 2).

Of all female students (n=197), 27% (n=54) tolerated uncertainty poorly, whereas the corresponding figure among males (n=109) was 11% (n=12); the difference between the males and females was highly significant (P<.001).

Discussion
The present study shows that one in five fifth-year medical students experience difficulty tolerating uncertainty when making medical decisions. These students were more often younger females and were also more often afraid of making mistakes. Those who tolerate

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Tolerating Uncertainty Quite Well or Well (n=240)</th>
<th>Tolerating Uncertainty Poorly (n=67)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females, %</td>
<td>59.6</td>
<td>81.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>25.8 (3.1)</td>
<td>25.3 (3.4)</td>
<td>.020</td>
</tr>
<tr>
<td>Mean duration being as locum doctor, months (SD)</td>
<td>3.6 (15.5)</td>
<td>1.9 (1.8)</td>
<td>.030</td>
</tr>
<tr>
<td>Fear of making mistakes, %</td>
<td>85.8</td>
<td>100</td>
<td>.0011</td>
</tr>
<tr>
<td>“If I made a mistake in my doctor work” (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“I would try to hide it.”</td>
<td>2.1</td>
<td>3.0</td>
<td>.66</td>
</tr>
<tr>
<td>“I would inform my supervisor.”</td>
<td>65.4</td>
<td>61.2</td>
<td>.52</td>
</tr>
<tr>
<td>“I would tell the patient and offer an explanation.”</td>
<td>71.3</td>
<td>64.2</td>
<td>.27</td>
</tr>
<tr>
<td>“I would tell the patient and apologize.”</td>
<td>70.0</td>
<td>83.6</td>
<td>.027</td>
</tr>
<tr>
<td>“I would try to attribute the error to my working community”</td>
<td>7.1</td>
<td>6.0</td>
<td>.75</td>
</tr>
</tbody>
</table>

* Differences between the groups were tested with X² test or Fisher’s exact test for categorical variables and with Mann-Whitney U-test for continuous variables.
Figure 1: How Students Felt About the Most Attractive Features of a General Practitioner's Work

The students were asked what features they considered the most attractive in a GP's work. The bars indicate the numbers of students who chose that feature as their first, second or third choice.

Figure 2: How Students Felt About the Most Unattractive Features of a General Practitioner's Work

The students were asked what features they considered the most unattractive in a GP's work. The bars indicate the numbers of students who chose that feature as their first, second or third choice.
uncertainty poorly more often considered a GP’s work too difficult and challenging than did those tolerating it quite well or well. Their attitudes differed when asked how they would deal with a situation in which they had made a mistake in their work: those tolerating uncertainty poorly would more often admit it to their patients and apologize than would those tolerating uncertainty better.

The strengths of this study include its fairly large sample size of fifth-year medical students and its high response rate. The students seemed to respond honestly and openly about their attitudes, feelings, and fears related to their work as a GP in the future. Students had spent 3 weeks in GP courses and practice in health centers during their previous medical studies. However, they had no previous experience of working as a locum resident at a health center even though they had been working for some time at a hospital as a locum resident. Therefore, consequently, their responses reflect their perceptions of a GP’s work, which they have developed in their early patient contact in health centers, following GPs’ consultations or developing their own consultation skills with real patients in primary care. This is a limitation of our study, and the findings are applicable only to fifth-year medical students. Another limitation of the study is that the responses are based on self-reported tolerance of uncertainty. It can be questioned whether these students can have enough insight of their own tolerance of uncertainty. However, the students did have experience in working as a locum resident. Therefore, they can reflect their feelings toward this past experience.

In our previous qualitative study, we found that one’s tolerance of uncertainty develops as a process during the course of medical studies. Thus, the findings of this study cannot be generalized to older doctors or residents, as the students beginning their fifth year of medical studies are still relatively young; in fact, most are about 23 years old, and their abilities to reflect on their professional-related uncertainties are naturally still developing. Rather, these findings reveal a certain phase in the developmental process of medical students learning to face uncertainty.

Our findings are in line with those of previous studies, thus suggesting that female doctors and doctors with less work experience are more prone to feel intolerant of uncertainty. Some prior studies suggest that intolerance of uncertainty is related to avoidance of working as a GP. Our study suggests that the picture may be more complex. Students who tolerate uncertainty poorly possess several features that may attract them later on to work as a GP in the future. They may tolerate having to deal with patients’ nonmedical problems better than the others. In addition, females tolerated uncertainty poorly more often than males. However, 75% of those specializing in general practice are females. Tolerance of uncertainty may be a feature that develops during the process when medical students grow into their role as a doctor. Fifth-year medical students are still in the middle of this process, which may last a very long time during a doctor’s career.

Some researchers have suggested that training medical students and junior doctors to tolerate uncertainty would help them to find their way to primary care. Whitehouse and colleagues reported that an integrated course that emphasized student self-direction diminished the students’ fears, when beginning to work as they began working as pre-registration house officers.

In their qualitative study, Fischer and colleagues also noticed that students are eager to learn from senior doctors who are open about their own medical errors. In this study, nearly all of the students and residents were thinking about and afraid to make mistakes at work. In our study, 100% of those who felt uncertain were afraid of making mistakes. They were more inclined to apologize to their patients than were those tolerating uncertainty better. This may reveal the students’ reflective skills, as well as a more open attitude toward acknowledging their feelings.

Pilpel and colleagues have studied the barriers to the acceptance of medical errors, and they found that denying uncertainty is an important emotional barrier. Hobgood and colleagues found in their study that residents in emergency medicine disclosed their errors to patients and families in only 28% of cases, even if they discussed them with their supervisors to a greater extent (in 71% of cases). This result is interesting as it markedly differs from our results, even if the sample in their study was smaller, and our study describes the attitudes of slightly younger doctors entering their last clinical year of medical school.

Hall claims that most of the time people are seldom conscious of the presence of uncertainty or deny the fact openly, potentially revealing a protective mechanism of the mind. Martinez and colleagues showed that some students in their essays criticized senior doctors attempting to hide errors or avoid responsibility. Those students who witnessed senior doctors take responsibility for their errors commented that such were the doctors to whose standards they aspired. Muller and Ornstein found that female students were more prone to feelings of guilt, anger (at themselves), and fear of losing confidence, when they had committed a medical error. Our findings showed when making medical decisions that females tolerated uncertainty more poorly and were more often afraid of making mistakes than were males. The reasons for this gender difference still remain unclear; however, and further research is needed. Further research is also needed to study the eventual changes in attitudes after medical students’ last courses in
Conclusions

Based on our study, those students experiencing feelings of uncertainty in medical decision-making may possess characteristics that are especially suitable to a GP’s work, such as reflective skills, which help them to acknowledge their feelings, and an ability to be more open with their patients. However, a rather large number in our study were afraid of making mistakes. Therefore, tolerance of uncertainty and medical errors should be dealt with more profoundly in students’ medical studies. More studies are needed to explore how tolerance of uncertainty develops during the course of medical studies and among junior doctors.

Acknowledgments: We thank Pirkko Salokktila, MD, for her valuable comments on the language in the first proofreading phase of the manuscript; Martina Torppa, MD, for her participation in the phase of creating the survey; Helena Liira, MD, PhD, for her expert teaching on the course on research methods that made this research much easier to conduct; and Helena Karppinen, MD, for her valuable support in the form of discussions during the editing process of the manuscript.

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References

ORIGINAL ARTICLE

The perceptions of a GP’s work among fifth-year medical students in Helsinki, Finland

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1University of Helsinki, Department of General Practice and Helsinki University Central Hospital, Unit of General Practice, 2Helsinki City Health Center, and 3Folkhälsan Research Center, Helsinki, Finland

Abstract

Objective. To explore medical students’ potential interest in family medicine in the future and their perceptions of a GP’s work. Design. A cross-sectional survey in 2008–2010. Setting and subjects. Fifth-year medical students prior to their main course in General Practice at the University of Helsinki. Main outcome measures. The students’ opinions regarding the GP’s work and their perceptions of the main aims of a GP’s work. Results. 309/359 medical students (mean age 25.7 years, 64% females) responded to the survey. Among the students, 76% considered the most attractive feature in the GP’s work to be that it is versatile and challenging. The least attractive features included: too hasty, pressing work, too lonely work, and too many non-medical problems. The majority of the students considered the main aim of a GP’s work as to identify serious diseases/disorders in order to refer those patients for specialized care (82%). Treatment of chronic diseases is an important responsibility of a GP’s work according to 63% of the students. Only 38% considered health promotion to be an important aim. Conclusions. Medical students may have perceptions of the GP’s work that influence their career choices to specialize in other fields.

Key Words: Long-term doctor–patient relationships, non-medical problems, perceptions of a GP’s work, versatile

Introduction

Current primary care practice has become pressing [1,2]. The ageing population with chronic diseases and a shortage of physicians has led to excessive workloads [1,3,4]. Physicians must deal with an increasing amount of paperwork [1,2], and new technologies have favored diagnostic skills, diminishing the amount of attention given to patients [5]. These changes have led to a waning reputation for family medicine and, consequently, the GP’s work has become less tempting for young doctors [3,4,6–10].

Medical curricula are often hospital-based, and there is little emphasis on community-oriented activities, prevention, doctor–patient communication, and teamwork [3,11–14]. Several reports suggest that there is a tendency for both teachers and students to undervalue family medicine [14,15]. Students’ interest in family medicine declines during their medical studies. Many students perceive a tendency on the part of their professors and peers to dismiss public health issues as being unimportant, thus imparting a hidden message that it is inferior to clinical medicine [7,15]. Positive role models in medical school [4,16,17], clinical training in family medicine [4,15,17] and social orientation [6] have an impact on choosing a career in family medicine. Young doctors often think that a GP’s work is too lonely [12].

In a qualitative study, Canadian family physicians considered rewarding dimensions of a GP’s work as being diversity and comprehensive care, having relationships with patients and their families, being an absorbed witness to the human condition, and providing continuity of care [2]. Excessive paperwork, workload and time pressure, and demanding patient expectations were considered as challenges in the GP’s work [2,18]. Variety of work is also a source of job satisfaction [19].
There are studies reporting medical students’ declining interest in family medicine [20], and family physicians’ opinions on the pros and cons of their work [2]. However, to our knowledge, there are only a few studies investigating medical students’ own perceptions and opinions of a GP’s work.

The aim of this study is to explore fifth-year medical students’ attitudes towards and perceptions of a GP’s work and their potential interest in family medicine in the future.

Material and methods

Participants

An electronic survey was conducted including all the fifth-year medical students prior to their main course in general practice in the medical school at the University of Helsinki between 2008 and 2010. The medical students in Helsinki have courses in general practice during the first (e.g. following family physicians’ practice), second (early patient contacts in community care) and third or fourth year of curriculum (first own-patient consultations in primary health care). The main course of general practice is during the fifth year of medical studies [21].

Questionnaire

The fifth-year medical students responded anonymously to the survey. The questionnaire was created by the investigators containing 25 different questions clarifying the aspects of the GP’s work (available from authors). The questions were retrieved from previous literature [1,2,4,6,12]. They intended to include some dimensions based on WONCA tree competences (community orientation, comprehensive approach, person-centered care) [22]. It also consisted of demographic factors and questions concerning their experience as an undergraduate locum doctor.

The questionnaire was piloted among students, and items were found easy to understand. Of the 359 medical students participating in the course of general practice during the years 2008–2010, 309 responded to the questionnaire (response rate 86%).

The students were asked what kind of features they felt to be the most attractive in the GP’s work. We offered alternatives from which the students were requested to choose the five most attractive features and to put them in a ranking order. Their first, second, and third choices were considered to be “the most attractive features” (see Table I). We asked, respectively, what kind of less attractive features they find in a GP’s work, and asked them to choose the five least attractive features from the alternatives offered, and to put them in a ranking order from one to five. Their first, second, and third choices were considered to be “the least attractive features”. We assessed the students’ opinions about the main aims of a GP’s work. We offered alternatives from which the students were requested to put them in a ranking order. Their first, second, or third choices were categorized as “the most important” and the others as “less important”.

Results were analyzed using SPSS statistical programs. Data were examined with statistical

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Table I. Features of GP’s work considered as the most attractive (cumulative percentage ranked as first, second, or third).

<table>
<thead>
<tr>
<th>Feature of GP’s work, %</th>
<th>Males (n = 109)</th>
<th>Females (n = 200)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Versatile and challenging work</td>
<td>74.3</td>
<td>76.5</td>
<td>0.67</td>
</tr>
<tr>
<td>Comprehensive doctor–patient relationships</td>
<td>45.0</td>
<td>37.0</td>
<td>0.17</td>
</tr>
<tr>
<td>Opportunity to meet people of different age groups and various backgrounds</td>
<td>39.4</td>
<td>41.0</td>
<td>0.79</td>
</tr>
<tr>
<td>Long-term patient relationships</td>
<td>38.5</td>
<td>35.0</td>
<td>0.54</td>
</tr>
<tr>
<td>Well-paid job</td>
<td>35.8</td>
<td>31.5</td>
<td>0.44</td>
</tr>
<tr>
<td>Rewarding work, grateful patients</td>
<td>26.6</td>
<td>28.5</td>
<td>0.72</td>
</tr>
<tr>
<td>Secure and respected job</td>
<td>11.0</td>
<td>17.0</td>
<td>0.16</td>
</tr>
<tr>
<td>A window to ordinary people’s everyday life</td>
<td>13.7</td>
<td>13.0</td>
<td>0.93</td>
</tr>
</tbody>
</table>

Notes: Differences between the groups were tested with a chi-squared test.
variables (frequencies, percentages, means, standard deviations, ranges). Groups were compared with the chi-squared test for categorical variables. \( P \leq 0.05 \) was considered statistically significant.

**Results**

The students’ mean age was 25.7 years (SD 3.2), and 64% were females. Their mean experience working as an undergraduate locum doctor was 3.2 months. The largest proportion of the fifth-year students (76%) regarded the versatile and challenging work as the most attractive feature of a GP’s work (Table I). The opportunity to meet different kinds of people of all ages and the comprehensiveness of doctor–patient relationships were considered as an important attractive feature by 40% of the students. There were no differences between males and females regarding the attractive features.

A majority of the students (69%) thought that too hasty and pressing work is the least attractive feature in the GP’s work (Table II). Of the students, 51% considered “too lonely work” and 53% “too much dealing with non-medical problems” as less attractive features in the GP’s work, respectively. A larger proportion of the female students found a GP’s work too lonely compared with the males \( (p = 0.037) \). Male students considered more often than females that a GP’s work includes too much dealing with non-medical problems \( (p = 0.043) \) and that it includes too many routine tasks and is tedious \( (p = 0.0048) \) (Table II).

The students’ opinions regarding the aims of a GP’s work are presented in Figure 1. Among the students, 82% considered that the most important aim of a GP’s work is to identify serious diseases/disorders in order to refer those patients for specialized care. Some 63% of the students considered the care of chronic diseases as an important aim of a GP’s work. The proportion considering health promotion as an important aim was 38%.

**Discussion**

Students appreciate the GP’s versatile and challenging work, the GP’s opportunity to meet people of different ages and various backgrounds, and the comprehensive doctor–patient relationships. However, they have preconceptions that the GP’s work is
to identify serious diseases and refer them for specialized care. This proportion was larger than the proportion considering care of chronic diseases or health promotion as the most important aim of a GP's work. There might be several reasons for this finding. First, fifth-year medical students have been trained during two clinical years primarily at the university hospital prior to their course in general practice. In Finland the medical faculty of Helsinki has a hospital-based curriculum. At the university hospital students meet only seriously ill patients, and specialist doctors emphasize that while working in primary care they have to be able to identify various serious diseases in order to refer such patients to hospitals. Students have readily picked up this message. Second, at this stage of medical studies, students are worried about their professional skills and they are afraid of making such mistakes, which might harm their patients [28]. Therefore, they are eager to consult specialist care and refer their patients to hospitals. In this respect it is understandable that they have this kind of conception of the GP's work. At this stage, medical students have not realized yet that in over 90% of the GP's consultations the patients are treated by the GPs themselves [29–31]. Only 4–10% of a GP's patients need specialized care [29–31]. In fact, the work in public health care centers in Finland concentrates on primary and secondary prevention, care and rehabilitation of various chronic diseases, as well as health promotion [32], although identification of chronic diseases is also important.

Our findings imply that it is important to be aware of medical students' attitudes towards and perceptions of the GP's work. Having positive role models in medical schools and guiding the medical curriculum to have more emphasis on community-oriented activities, prevention, and doctor–patient communication may influence students' orientation towards family medicine.

The strength of our study is a high number of respondents and a high response rate. The students seemed to respond honestly about their attitudes, feelings, and fears related to working as a GP in the future. One limitation of this study is its cross-sectional nature. The predefined questions in our survey may have guided the students' responses. The students responded to this questionnaire before their main course of general practice. Thus, the responses could have been different after this course and rotation as suggested in a study performed in the USA [20]. However, our students had had at least three weeks of experience of primary health care during their prior studies before this survey. In addition, the findings may not be generalizable in other cultures or not even to other faculties in
Perception of a GP’s work among medical students

Virginia Kuropka

Abstract

Background

The students seem to be well aware of the attractive and less attractive features of the GP’s work. They pay great attention to the possibility of missing some patient with (a serious) disease since they think that identifying serious diseases is a more important part of GP’s work than treatment of chronic diseases or health promotion. These concepts may influence their career choices. It is important to be aware of students’ perceptions in order to focus on the medical studies and courses of general practice.

Conclusion

The students seem to be well aware of the attractive and less attractive features of the GP’s work. They think that identifying serious diseases is a more important part of GP’s work than treatment of chronic diseases or health promotion. These concepts may influence their career choices. It is important to be aware of students’ perceptions in order to focus on the medical studies and courses of general practice.

Ethics

Permission for this study was obtained from the Planning Committee for Undergraduate medical education.

Declaration of interest

The authors report no conflicts of interest. The writing of the paper.

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ORIGINAL ARTICLE

Medical errors and uncertainty in primary healthcare: A comparative study of coping strategies among young and experienced GPs

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Abstract
Objective. To study coping differences between young and experienced GPs in primary care who experience medical errors and uncertainty. Design. Questionnaire-based survey (self-assessment) conducted in 2011. Setting. Finnish primary practice offices in Southern Finland. Subjects. Finnish GPs engaged in primary health care from two different respondent groups: young (working experience ≤5years, n = 85) and experienced (working experience > 5 years, n = 80). Main outcome measures. Outcome measures included experiences and attitudes expressed by the included participants towards medical errors and tolerance of uncertainty, their coping strategies, and factors that may influence (positively or negatively) sources of errors. Results. In total, 165/244 GPs responded (response rate: 68%). Young GPs expressed significantly more often fear of committing a medical error (70.2% vs. 48.1%, p = 0.004) and admitted more often than experienced GPs that they had committed a medical error during the past year (83.5% vs. 68.8%, p = 0.026). Young GPs were less prone to apologize to a patient for an error (44.7% vs. 65.0%, p = 0.009) and found, more often than their more experienced colleagues, on-site consultations and electronic databases useful for avoiding mistakes. Conclusion. Experienced GPs seem to better tolerate uncertainty and also seem to fear medical errors less than their young colleagues. Young and more experienced GPs use different coping strategies for dealing with medical errors. Implications. When GPs become more experienced, they seem to get better at coping with medical errors. Means to support these skills should be studied in future research.

Key Words: Coping, Finland, general practice, GPs, medical error, primary care, uncertainty

Introduction
Medical errors and patient safety are important concerns for physicians, especially for those working in primary health care as the working environment is often busy, the variation in patients’ symptoms and diseases is extensive, and the GPs are easily distracted by various interruptions [1]. Sandars and Esmail found in their review of several studies in primary care that the definition of a medical error was inconsistent and the medical error rates varied greatly [2]. The most important were errors relating to diagnosis, extending from 26% to 78% of all errors identified [2]. However, Hoffman et al. argued that 72.9% of errors reported by primary care physicians were process errors, i.e. errors related to the processing of a patient through the health care system, such as choosing the wrong treatment, or failure in communication, for example misunderstandings [3]. They suspected a bias towards reporting only most serious events [3].

Sandars and Esmail noted that a tired physician or a physician with a very busy schedule was a risk factor for errors, as 10% of the errors were caused by either [2]. Among young physicians fatigue and distress have been associated with committing medical errors [4]. Berner and Graber found that overconfidence is a risk factor for a diagnostic error [5]. Atypical presentations of a disease as well as certain medical conditions, such as breast cancer, dementia, and myocardial infarction, have been associated with...
Little is known about the differences between young and more experienced GPs and how these two groups see and cope with medical errors and uncertainty in medical decisions.

Young and more experienced GPs seem to cope in different ways with medical errors, which may suggest a generation gap.

More often than their younger colleagues, experienced GPs find that disturbances during face-to-face consultation with a patient might predispose to medical errors.

Experienced GPs seem to better tolerate uncertainty in medical decision-making than their younger colleagues.

diagnostic error or delay in primary care [6]. There are contradictory findings on how interruptions and distractions in consultations affect physicians’ performance, i.e. when the doctor is completing a patient-related task at hand [1,7,8].

McIntyre and Popper stated in their article from 1983 that in historical time physicians as authorities were not expected to make mistakes [9]. Therefore, it was better to hide mistakes rather than report them to others [9]. According to Kaldjian et al. physicians still share a certain dilemma regarding mistakes [10]. Physicians have a desire to learn from them and to share those lessons with their peers. However, it is difficult as there is always a risk of loss of reputation, as well as disciplinary actions and embarrassment [11]. Older physicians may prefer to suffer alone, pondering over the negative effects possible disclosure could have on their relationships with patients, their careers, and self-confidence [12]. Some studies have suggested that physicians are unsure where to seek emotional support when errors occur, and they are worried that disclosing errors to patients might damage their reputation, as well as being awkward and uncomfortable [11]. Patients, however, wished to be told about any error that had caused them harm [11].

It has been stressed that residents, i.e. young physicians, will benefit most from learning opportunities, where they can discuss medical errors with their peers and supervisors [13,14].

In our previous study we found out that students in the fifth year of medical school tolerating uncertainty poorly were significantly more often afraid of making mistakes than those tolerating uncertainty well [15]. Less has been written on the topic of how physicians cope with the fear of making mistakes, and the possible differences in coping strategies, when it comes to age and several years of experience.

The aim of this study was to compare experiences of uncertainty and medical errors between younger and experienced GPs in primary healthcare. Specifically, we explored how the fear of committing medical errors is associated with the GPs’ extent of experience and how many they actually commit, and how they cope with medical errors. We use the terms “mistake” and “error” throughout the text.

**Material and methods**

A questionnaire-based survey was sent to a convenience sample of GPs in Southern Finland. Contact GPs from health centres in Southern Finland were invited to participate in the survey and to provide e-mail addresses of their colleagues in their workplace. We received 244 email addresses. During the year 2011, 165/244 (response rate 68 %) persons, both young and more experienced GPs, responded. Reminders were sent to those who had not responded via a second e-mail. The questionnaire was developed by using a few of the questions from our former survey of fifth-year medical students as well as another prior questionnaire developed for the detection of work-related exhaustion among physicians [15,16]. Our questionnaire was responded to anonymously.

In this report, we limit the topic to committing medical errors and questions related to this in the survey. We did not define the concept of medical errors in order to enable the participants to associate freely regarding their experiences. This choice was intentional as a strict definition might have hampered the GPs’ responses.

The questionnaire included demographic variables (Table I). It also inquired about the participants’ views on tolerance of uncertainty, making mistakes, and which factors predispose them to mistakes or influence their ability to avoid mistakes. We have decided to present participants divided by years of working experience, the cut-off point being five years of working experience, hence the group of younger GPs had five years or less, the experienced GPs had more than five years.

The item concerning tolerance of uncertainty was phrased as: “I have difficulties in tolerating uncertainty in diagnostics and/or medical decision making’’; “I tolerate uncertainty quite well in diagnostics and/or medical decision making’’; “I tolerate uncertainty very well in diagnostics and/or medical decision making’’.

The item about fear of making mistakes was phrased as follows: “Are you afraid of making a mistake working as a GP?’’ (possible responses: Yes/No/I have not thought about it more specifically).

The questions used on mistakes were phrased as follows: “(1) Have you committed a medical error in
patient-related work during the past year?” (Yes/no).
“(2) What did you do when you committed a medical error in your work?” Several options could be chosen: “I tried to hide it” (yes/no); “I told my supervisor or a colleague about it” (yes/no); “I told the patient and gave an explanation” (yes/no); “I told the patient and apologized” (yes/no); “I tried to search for a cause in my work community” (yes/no).

The participants were also asked which factors in work predispose to committing a medical error and which factors help to avoid them (Table II).

In statistical analysis, the variables are presented as means with standard deviations or as percentages. The comparisons between categorical variables are made with a chi-squared test or Fisher’s exact test, and between the non-normally distributed continuous variables with the Mann–Whitney U-test. P-values < 0.05 are considered significant; 95% confidence intervals were calculated for the main results.

Results
Uncertainty and fear of medical errors
The mean age of the respondents was 31.2 years for the young GPs with less than five years of working experience, and 48.4 years for the experienced GPs with more than five years of working experience. The experienced GPs tolerated uncertainty better. Among these, 53.8% (95% Confidence Interval (CI) 42.2–65.0) tolerated uncertainty well, whereas among the younger GPs the figure was 25.9% (95% CI 17.0–36.5) (p < 0.001). Among the experienced GPs, only 1.3% (95% CI 0.0–6.8) tolerated uncertainty poorly whereas the respective figure for young GPs was 5.9% (95% CI 1.9–13.2) (p = 0.11). Over 80% of all of the primary care physicians had sometimes thought about the possibility of a patient complaint, an accusation, or a lawsuit. There were no differences between the groups. The young GPs significantly more often experienced fear of medical errors (70.2% vs. 48.1%) (p = 0.004) (see Table I).

A larger proportion of young GPs (83.5%, 95% CI 73.9–90.7) than experienced GPs (68.8%, 95% CI 57.4 to 78.7) had also committed a medical error during the past year (p = 0.026) (see Table I).

Coping with medical errors
The young GPs were more prone to tell their supervisors or a colleague about an actual medical error than the experienced GPs (72.2% (95% CI 62.2–82.0) vs.

Table II. Uncertainty and fear of medical errors.

<table>
<thead>
<tr>
<th></th>
<th>GPs with ≤5 years of working experience (n = 85)</th>
<th>GPs with &gt;5 years of working experience (n = 80)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerating uncertainty well, % (95% CI)</td>
<td>25.9 (17.0–36.5)</td>
<td>53.8 (42.2–65.0)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Tolerating uncertainty quite well, % (95% CI)</td>
<td>68.2 (57.2–77.9)</td>
<td>45.0 (33.8–56.5)</td>
<td>&lt; 0.003</td>
</tr>
<tr>
<td>Tolerating uncertainty poorly, % (95% CI)</td>
<td>5.9 (1.0–13.2)</td>
<td>1.3 (0.0–6.8)</td>
<td>0.11</td>
</tr>
<tr>
<td>Fear of committing a medical error, % (95% CI)</td>
<td>70.2 (39.3–79.7)</td>
<td>48.1 (36.7–59.6)</td>
<td>0.004</td>
</tr>
<tr>
<td>Has sometimes thought about the possibility of a patient complaint, an accusation, or a lawsuit, % (95% CI)</td>
<td>82.4 (72.6–89.8)</td>
<td>81.2 (71.0–89.1)</td>
<td>0.85</td>
</tr>
<tr>
<td>Has committed a medical error during the past year, % (95% CI)</td>
<td>83.5 (73.9–90.7)</td>
<td>68.8 (57.4–78.7)</td>
<td>0.026</td>
</tr>
</tbody>
</table>

Notes: Difference between the groups in categorical variables was tested with a chi-squared test. (95% CI) = 95% confidence interval for the differences between the groups.
56.3%, (95% CI 44.7–67.3) (p = 0.025)). The experienced GPs were more prone to apologize to the patient about a medical error (65.0% (95% CI 53.5–75.3) vs. 44.7% (95% CI 33.9–55.9) (p = 0.009)). About 5% in both groups admitted that they had tried to hide an error (Table III).

Means to avoid medical errors

There were some significant differences between the groups when asked about which factors predisposed to mistakes or helped to avoid them. The experienced GPs felt more often than the young GPs that nurses' and colleagues' consultations were a disturbing factor while seeing a patient (56.3% (95% CI 44.7–67.3) vs. 36.5% (95% CI 26.3–47.6), (p = 0.011)) (Table IV). There were no other significant differences between the groups related to factors predisposing to medical errors.

The young GPs found electronic databases more useful than the experienced GPs (100% (95% CI 95.8–100.0) vs. 93.7 (95% CI 85.8–97.9), (p = 0.018)) (see Table IV).

Discussion

Medical errors seem to happen frequently in primary care since 76% of the GPs in our study admitted to having committed a medical error during the past year. The young GPs stated more often than the experienced GPs that they had committed a medical error during the past year in this study. There were also differences in coping strategies between these groups: the experienced GPs admitted apologizing to the patient more often than their younger colleagues, whereas the young GPs were more prone to tell their supervisor or a colleague about a mistake than the experienced GPs. The young GPs more frequently favoured consultations on-site and electronic databases when trying to avoid mistakes compared with the experienced GPs. The experienced GPs felt more often than their younger colleagues that nurses' and colleagues' consultations during a patient appointment were a risk for committing a medical error.

The strength of this study is that the survey was sent to primary care physicians, both young and experienced, as the majority of prior research on this topic has been performed in hospital environments.
An additional strength of our study is the relatively good response rate, as it adds to the representativeness of our results. We used a convenience sample and conducted the survey via our contact GPs in primary care in order to make sure that this survey would reach those who actually work in these health centres. The limitation of our study is the fairly small sample size compared with the hospital-based studies. However, to our knowledge, there are very few prior studies exploring this topic in primary care [2,20]. Another limitation is the self-perceived nature of medical error by the respondents, as our study is based on the experiences of physicians working in primary care, which errors they considered to be significant, and their willingness to report them [4]. Relying on memory and willingness to remember may underestimate the true prevalence of medical errors. In addition, primary care settings differ in different countries. Therefore, the findings of our study are not directly applicable to other countries.

Sandars et al. stated in their review that medical errors occur 5–80 times per 100,000 consultations in primary care [2]. However, it is extremely difficult to compare the prevalence rates since the definitions and methods of detecting errors have varied from study to study. In our study, 84% of the young GPs and 69% of the more experienced GPs admitted having committed a medical error during the last year. Wu et al. (1991) surveyed 254 house officers regarding their most significant mistake, of whom 45% reported having made a mistake [21]. In a survey among resident physicians in the US, 34% of participants had made at least one major medical error [15]. The difference in these findings compared with ours may reflect a different definition and timescale of errors as in our study the participants could include all possible errors in their figures.

Physicians are, however, reluctant to disclose their errors to patients. In our study, 55% of the GPs had spoken about a mistake to their patient. This figure is higher than in the study by Kaldjian et al. in which only 41% of the physicians actually spoke about a minor error to a patient [16]. In our study, 72.9% of the young and 56.3% of the experienced GPs had spoken about a mistake to either their supervisor or a colleague. This is consistent with prior studies in which 57–88% of young physicians had discussed their mistakes with their colleagues [12,14]. Training young physicians to discuss their errors has been emphasized [17–19]. A specific model to enhance error disclosure has also been developed [13]. Crook et al. stated that the ability to disclose errors is highly dependent on the level of maturity of a physician, and many younger physicians need time to develop that particular skill [22]. Somewhat in line with this finding, in our study the young GPs were more willing to discuss their errors with their colleagues but less willing to apologize to their patients than more experienced GPs (44.7% vs. 65.0%). The proportion willing to apologize is higher than in previous studies in which 21% to 34% of physicians apologized for the situation associated with the mistake [14,23,24]. Cultural differences might possibly be one reason for the different figures.

Factors predisposing to medical errors have been investigated in a few studies [23–26]. The reactions of physicians to interruptions while seeing a patient have been studied by some researchers [7]. In our study both the young and the more experienced GPs did find interruptions somewhat disturbing and the older more so.

We also posed questions in our study on which factors the participants find helpful in avoiding mistakes and the young GPs considered consultations on-site and electronic databases to be more helpful than the experienced GPs.

The greater fear of making mistakes among the young physicians may have several reasons, one of the most important being their lack of experience [14]. It seems that long-term experience in primary care helps GPs to deal with their fears and also helps them to tolerate uncertainty. In our prior study of fifth-year medical students, 90% were afraid of making mistakes and 22% felt they had difficulties in tolerating uncertainty [15]. Uncertainty and fear of making mistakes seem to reduce gradually with accumulating experience, as the young physicians reflect on the two entities and learn how to deal with them.

Conclusions

Young GPs fear and commit medical errors more often than experienced GPs. Experienced GPs tolerate uncertainty better than the young. Young and experienced GPs use different coping strategies with medical errors. Young GPs tend more often to speak about their medical errors to other colleagues whereas experienced GPs more often apologize to their patient.

Further research is needed to effectively support and ameliorate the developmental process of young and even experienced GPs related to dealing with mistakes and tolerating uncertainty.

Implications

Young GPs may benefit from the possibility to consult on-site, and therefore a good tutoring system
should be developed at every health centre or group practice where young GPs work side by side with more experienced colleagues. It is as also important that the horizontal consulting of other colleagues working at the same health centre or group practice is enabled and encouraged, for example by inserting in the time schedules of both experienced and young GPs so-called consultation hours once or twice a week, when the young GPs could come and ask for advice. However, the effectiveness of this approach in preventing medical errors still warrants further study.

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Declaration of interest
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References