Unlimited exposure. The patient mix of GP trainees and their trainers: gaps, disparities, and active steering

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CHAPTER 8

General Discussion
General Discussion

1. Introduction to the general discussion

This thesis was undertaken to gain a better insight into the patient mix that GP trainees are confronted with during their specialty training. To this end, a cohort study was started which enrolled 73 GP trainees and their trainers. The patient mixes of trainees and trainers were compared and areas of low exposure were identified. Reasons for the differences in the patient mixes of trainers and trainees due to the assigning behaviour of receptionists were addressed. The cohort study was followed by a randomized controlled trial (RCT) in which the patient mix of half of the trainees was actively steered on skin diseases and psychosocial conditions successively. The aim of the RCT was to study whether steering was possible and, if so, whether it would lead to a better learning outcome. Learning outcome was measured by self-efficacy questionnaires and a knowledge test. Because our instrument for describing patient mix was based on the ICPC coding, the barriers that the GP trainees and trainers faced in their daily clinical work to ICPC coding and specific situations prone to non-coding were studied. To obtain more insight into the relationship between patient mix and learning, a systematic review of this relationship in work-based clinical settings was carried out.

In the first part of this general discussion, the main findings are summarized per chapter and the interpretation and implications are discussed. The results of Chapters 4 and 5 are discussed together. In the second part, more general educational implications for the GP specialty training are discussed. Finally some recommendations for future research are given.

2. Main findings, interpretation, and implications

**CHAPTER 2: WHAT IS KNOWN ABOUT THE RELATIONSHIP BETWEEN PATIENT MIX AND LEARNING IN WORK-BASED CLINICAL SETTINGS?**

**Main findings:** In Chapter 2, the evidence of the relationship between patient mix and learning in the field of medical education was systematically reviewed. Descriptions of patient mix in the 22 reviewed studies were heterogeneous. They were related to different outcomes in different settings, at different stages of education.
Patient mix was found to be related to self-reported learning outcome, the experienced quality of the training programme being most evident. Other learning-related factors, such as supervision and learning style, seemed to mediate the relationship between patient mix and learning. A relationship between patient mix and formal assessment was rarely demonstrated.

**Interpretation and implications:** Interpretation of the evidence was hampered by the absence of a widely accepted definition of the concept of ‘patient mix’. The patient mix as presented often seemed to depend on the instrument the authors had at their disposal more than on a specific operationalization of the patient mix under investigation. The interventions on the patient mix that we found were indirect (due to curriculum change); not meant to actively influence the patient mix.

It can be questioned whether formal assessments are sensitive enough to ascertain how patient mix can affect learning outcome. The positive relationship between patient mix and self-assessment outcome is not per se an indication of a relationship between patient mix and learning. The absence of a relationship between patient mix and formal assessments might lead to the conclusion that increasing experience does not *automatically* lead to more competence. This is in line with the deliberate practice theory (see Introduction), which states that feedback is required. The relationship between patient mix and learning is clearly complex, and many other variables play a role (such as supervision quality, learning style, learning environment and professionalism). Educational research would benefit from a standardized approach in patient mix descriptions. An inquiry into more detailed aspects of patient mix in relation to their contribution to learning is desirable.

**CHAPTER 3: WHAT IS THE RELATIONSHIP BETWEEN THE BARRIERS TO ICPC CODING OF GP TRAINEES AND TRAINERS AND THEIR SELF-REPORTED AND ACTUAL CODING PERFORMANCE?**

**Main findings:** To gain insight into the validity of our patient mix descriptions, the coding behaviour of the trainers and trainees was investigated in a questionnaire. Results were compared with coding performance as measured by EPR extractions. Hence, coding bias, due to the barriers that GP trainers and trainees experience while using the ICPC classification system, was addressed.

The percentages of contacts with an ICPC code were high, both for trainers and for trainees. They reported that most barriers were of minor importance. Coding performance was best predicted by motivation- and ICPC-related barriers.
Trainers’ estimation of their coding performance was reasonably accurate, considering the high correlation with the actual coding percentage. For trainees, this correlation was lower. Trainers’ ICPC coding behaviour seemed to be influenced more by the extent to which they experience barriers than the trainees’ coding behaviour.

**Interpretation and implications:** The only situations we found to be prone to non-coding were telephone consultations, repeat prescriptions, and administrative actions. The latter two are of minor importance since they were disregarded in our patient mix descriptions. EPR-based data thus seem to provide a representative reflection of the patient mix seen by trainers and trainees. This makes these data suitable for research and educational purposes, as used in this thesis. To further reduce the chance of biased results, the content of the non-coded telephone consultations should be addressed in future studies.

**CHAPTER 4 & 5: THE PATIENT MIX THAT GP TRAINEES ENCOUNTER IN GP TRAINING PRACTICE: DIFFERENCES BETWEEN FIRST- AND THIRD-YEAR TRAINEES AND BETWEEN TRAINEES AND THEIR TRAINERS, IN BOTH HIGH- AND LOW-EXPOSURE AREAS**

In the following paragraphs, the relevance of the most meaningful disparities that were found is discussed. Implications of these disparities and areas of low exposure are considered in relation to the health care that GPs are required to provide as described by the Dutch College of General Practitioners (NHG) and the Dutch Association of General Practitioners (LHV) in ‘Health Care Supply General Practice 2009’² and in relation to the ‘Competency Profile and Final Requirements of the General Practitioner’ by the Dutch GP Training Institutes.³ In addition, implications due to demographic trends⁴ are commented on, led by the NHG and LHV’s ‘Vision for the future 2012’⁵ which will be updated shortly.⁶

**Contact numbers**

**Main findings:** The mean number of face-to-face consultations per trimester did not significantly differ between the first and third year of training (see Chapter 4), but the standard deviation almost doubled in the third year, indicating more variance in the number of patient contacts among third-year trainees. Closer examination showed that this was largely due to several trainees who saw exceptionally large numbers of patients. Trainees did about double the number of consultations and home visits, and treble the number of telephone consultations compared with train-
Interpretation and implications: Trainees who see large numbers of patients build more experience. To what extent this experience also will lead to more learning and, ultimately, better performance is unknown. It would be interesting to study which part of their higher workload is due to individual characteristics of these trainees, such as their working speed, their trainers’ characteristics, or the organizational factors of the training practice, such as the practice setting and surgery planning (see Chapter 5).

The finding that GP trainees are exposed to half the amount of patients compared with their trainers, poses the question whether the trainees are sufficiently prepared to handle the workload when starting to work as an autonomous GP. This emphasizes the importance of the ‘autonomous’ periods in which the trainee is working alone in the practice without the presence of their supervisor. In these periods, they become better prepared to the working speed of regular GP surgery hours. Interventions to increase the work speed, e.g. extension of the autonomous period, could help to prepare trainees for their future job. The workload of a regular GP is a challenge for newly qualified GPs when running a practice themselves. The ability to keep control on the higher workload is perhaps one of the reasons why they have a preference for working as a locum doctor or under contract, instead of immediately starting a practice themselves.7

The total number of patient contacts per trimester in training practices is about the same as in regular (non-training) GP practices.8,9 We did not investigate whether there are other differences in patient populations between regular and training practices. Comparison of our data with national data (Chapter 5), did not point in that direction.

Age distribution
Main findings: Significant differences between trainers and trainees were found in all patient age groups, except the 25–44 and 75+ year groups. In general, trainees see a higher proportion of younger patients, whereas the opposite is the case for their trainers.

Interpretation and implications: The reasons for this uneven age distribution may well lie in other patient mix characteristics which relate to age: trainees see fewer chronic conditions, which are more often present in older patients. Patients with chronic conditions may feel more comfortable with the trainer.10 In addition,
trainees see more minor ailments and respiratory infections, which are more often present in children. The latter can be regarded as positive, because becoming familiar with care for children is an important learning objective for many trainees. Furthermore, by seeing children together with their parent(s) a trainee becomes familiar with the family doctor’s role.

**Chronic diseases**

**Main findings:** The exposure to chronic diseases increased steadily during the training. Trainees saw a smaller proportion of chronic conditions than their trainers (first year: 8.7% vs. 15.8% and third year: 10.8% vs. 16.2%, Chapter 5). Similar results were found for oncological conditions (which come under the category of chronic conditions; 0.4% vs. 1.7% and 0.9% vs. 1.8%).

**Interpretation and implications:** In Chapter 4, it is explained that the actual number of chronic conditions encountered by trainees (and trainers) is probably higher than our findings suggest, as our software was programmed to count actual health problems and not co-morbid chronic conditions. The steadily increase in exposure is in line with the learning objectives, as the third-year curriculum places emphasis on chronic and complex conditions. However, as is shown in Chapter 5, in the third year, a substantial disparity still was found between the proportional exposure of trainers and trainees. Our results thus confirm the finding of earlier studies that GP trainees saw fewer chronic conditions than trainers. Several authors have warned about under-exposure of trainees to chronic conditions. Darer et al. found that the majority of US GPs felt inadequately trained for chronic diseases, and Card et al. reported that recently graduated internists felt insufficiently prepared for the care of patients with chronic conditions. Given the challenges of the ageing population, it can be concluded that trainees should handle more patients with chronic disease. This is also in agreement with recommendations in the ‘position papers’ of the NHG regarding chronic disease in which the importance of preparing GP trainees for care of the elderly and for complex care is emphasized, and cooperation between GP training programmes and other primary (nursing home doctors) and secondary care specialists (geriatricians, specialists in geriatric psychiatry) is recommended.

Trainees also saw very few oncological conditions. The recommendations in a report on the GP’s role in the aftercare of cancer patients, which was recently published by the Dutch Cancer Society, pleaded for a much larger role of the GP in the
aftercare and the organization of care for the oncological patient. In this report, tuning and synchronizing the care provided by the GP and the medical specialist is emphasized. The committee recommends that combined training programmes are set up for primary care specialists (including GPs) and secondary care specialists informing them about how to act in the different phases of the oncological chain of care. Similar to chronic conditions, oncological conditions may have been under-reported, but the level of exposure to oncological conditions we found in Chapters 4 and 5 is likely insufficient to fulfil these training recommendations. The low exposure might change in the future due to the ageing population, but until then, the second-year ‘chronic disease’ rotation in nursing homes, clinical geriatric wards or in palliative care, maintains an important part of the current GP training programme.

Female conditions

Main findings: In line with other studies of medical students and family medicine residents, female conditions were seen more often by female trainees than by male trainees (Chapter 4). Our analyses in Chapter 5 showed that differences in seeing female conditions were primarily related to the doctor’s gender.

Interpretation and implications: Eccles et al., Fleming and others found that male and female trainees saw fewer female conditions than their trainers did whereas our results showed that this was primarily related to the gender of the doctor. As the majority of the GP trainees nowadays are female, perhaps a former preference for the more experienced trainer (predominantly male) is nowadays counteracted by a stronger preference for a female doctor. Assuming that male and female GPs should be equally competent, our findings can have implications for the competence development of male trainees. Whether the males reach the required level of competence should be further studied.

Male conditions

Main findings: The numbers of male conditions encountered were low and did not significantly differ between female and male trainees (Chapter 4). However, male doctors (trainees and trainers combined) encountered a significant larger proportion of male conditions than female doctors (Chapter 5).

Interpretation and implications: The low numbers of male conditions questions whether there were sufficient encounters for trainees to acquire competence. A potential, gender-related, underexposure was also addressed by Levy and Merchant,
who found that male students received more experience with male-specific examination skills. However, since the numbers and percentages we found were low, one could question whether the significant difference is also educationally relevant.

**Psychological and psychiatric conditions**

**Main findings:** Similar to the results in other studies,\(^{12,25,26,28,31}\) the trainees saw fewer psychiatric conditions than their trainers (Chapter 5). This was more pronounced in first-year than in third-year trainees (Chapter 4). Compared with national morbidity data,\(^{32}\) the difference in exposure between trainees and regular GPs was less.

**Interpretation and implications:** An explanation for the differences found may be that one third of the medical receptionists tend to assign patients with psychological problems to the trainer (Chapter 6, see also next paragraph). The ‘position paper’ of the NHG on Psychiatric care in General Practice is explicit about the central role and far-reaching responsibilities the GP should have in the care of patients with acute and chronic psychological problems.\(^{33}\) This states, among other things, that the GP is responsible for diagnosing psychiatric problems, orchestrating the care process, identifying patients (including children) at risk of developing psychiatric problems, taking preventive interventions, and caring for psychiatric patients who cannot be treated or can no longer be treated in secondary care. Training in preventive tasks is explicitly recommended, as is cooperation with other professionals. It is questionable whether the actual exposure provides enough learning opportunity to fulfil the demands of this ambitious future vision.

Our intervention intended to increase the exposure to psychiatric and social conditions was not successful (Chapter 7, see further). However, seeing more patients with these conditions did improve self-efficacy in this area. This makes it worthwhile to consider stronger interventions to steer the patient mix in this area. Additional measures, such as requiring pre-specified contact numbers, can be helpful to accomplish this. In addition, the rotation in the second year of the training in inpatient and outpatient psychiatric clinics maintains an important addition to the training programme.

**Social conditions**

**Main findings:** The exposure to social problems seemed low, and the exposure was even lower for the trainees than for the trainers. Trainers with a coding percentage
over 90% saw more psychiatry and social problems than trainers within the 50–90% range, indicating that psychosocial codes are under-reported by some trainers. This was not found to be the case for the trainees.

**Interpretation and implications:** Trainers and trainees may be reluctant to assign social codes, such as ‘burnout’ or ‘child abuse’, as this might harm their relationship with the patient or even have legal consequences (patients in the Netherlands have the legal right to see their medical notes).

Another explanation for the under-reporting of social codes is that they are perceived to be heterologous ICPC codes and/or ‘second choice’. As a result, social codes are possibly only picked if no other code fits, or in very obvious situations. It thus can be questioned whether the social problems of a population are properly reflected by the ICPC codes of EPR-based data. When asked for situations prone to non-coding on ICPC coding barriers (Chapter 3), social problems were not mentioned spontaneously. Unfortunately, we did not actively ask whether the trainees and trainers experienced coding social problems as a barrier.

**Cardiovascular prevention and diabetes mellitus**

**Main findings:** Differences between trainers and trainees found in previous studies regarding circulatory\textsuperscript{12;25-29;34} and metabolic\textsuperscript{12;25;26;28} diseases were confirmed in our study. When focusing on cardiovascular prevention, the proportion of patients seen by trainees for cardiovascular prevention was about half that of their trainers. With respect to diabetes mellitus, the proportion of patients seen by first-year trainees was half of that seen by their trainers; for third-year trainees, the proportion of patients seen by the trainers and trainees was comparable.

**Interpretation and implications:** The trainee/trainer differences regarding cardiovascular prevention indicates under-exposure; however, the exposure was still substantial, so competence development may be unabatedly possible. A potentially more problematic situation regards diabetes mellitus. The majority of the training practices included in the study had a nurse practitioner (NP) working in the practice. This is in line with the result, as was found in our national survey among medical receptionists (86% of the practices had an NP; Chapter 6). NPs hold consultations of patients with diabetes mellitus under the final responsibility of the GP, so competence of the GP is required.\textsuperscript{35} Since the entry of NPs into primary care, the daily workload of GPs with diabetic patients diminished, as did the daily practice of their trainees.\textsuperscript{36}
Training programmes should respond to the threat of too little diabetes experience, which may result in insufficient competence, and to the consequences of this relatively new type of care organization. Tailored training and interventions directed at the participation of the trainee in the NP’s surgery hours, and at the supervising sessions that the GP holds with the NP should be considered. The experience of GPs and their trainees with diabetes care is not fully reflected by EPR-data extractions, because their NP-supervising activity is not always registered in the EPR, at least not for the trainees. Moreover, as stated before, the software did not count co-morbid conditions; if diabetic patients present with complaints leading to ICPC codes, their diabetic condition may also be considered, but this might not be reflected by the registered code (e.g. dizziness, incontinence, overweight, etc.).

Acute diseases

Main findings: In Chapter 5, it is shown that trainees in the first year saw fewer acute conditions than their trainers (1.8% vs. 2.3%). The difference was not significant in the third year (2.2% vs. 2.4%). These small differences do not seem to be relevant since the numbers these proportions represent are relatively low.

Interpretation and implications: It should be noted that GP trainees acquire most of their experience with acute conditions during their out-of-hours care in central GP cooperatives and during the emergency care rotation in the second year of the training. The EPR extractions that were used in our studies did not comprise those data. Therefore, a complete overview of all acute conditions GP trainees are confronted with during their training could not be provided.

There was no workable cluster of acute conditions available. We therefore composed a cluster of ICPC codes, defined by ‘disease or condition for which diagnostic and/or therapeutic action is required immediately or at most within hours; the seriousness of the condition is not relevant.’ We did not check the exclusive use of these ‘acute’ ICPC codes on the acute moment of presentation, so it is possible that the ICPC code was also used in a non-acute follow-up consultation (e.g. wound control). The low exposure during daytime and the high level of competence that is demanded, emphasize the importance of the training in the GP cooperatives and of the second-year emergency care rotations. To complete the picture, monitoring of the trainees’ patient mix during their work in the GP cooperatives should be considered.
Minor illnesses

**Main findings:** The exposure to minor illnesses was almost the same for first- and for third-year trainees (36.3% vs. 35.9%). In line with other studies, trainees saw more minor illnesses than their trainers.

**Interpretation and implications:** In the first year of training, this does not seem to be a problem, since most trainees have no or very little experience with these illnesses, and this is a year-specific learning goal. By seeing minor illnesses, trainees also gain more experience in their role as a family doctor. Boredom or saturation is unlikely, since the cluster consisted of 278 different ICPC codes (some did overlap) of which the most frequently encountered (R74 Upper respiratory infection acute, R74.1 Common cold and R74.2 Acute pharyngitis) together accounted only for 5.2% of the trainees’ patient mix (see Chapter 5). For third-year trainees, however, this might be a disproportionally large part of the patient encounters, considering the year-specific training goals.

Musculoskeletal, respiratory, and skin conditions

**Main findings:** Trainees saw musculoskeletal, respiratory, and skin diseases most frequently (Chapters 4 and 5), and the latter two significantly more than their trainers did.

**Interpretation and implications:** Here, saturation with specific diseases is also unlikely; however, if acute respiratory diseases, acute or chronic sinusitis, acute bronchitis/bronchiolitis, and cough are combined (Table 1, Chapter 5) they roughly account for 10% of the trainees’ patient mix. The learning benefit of this relatively large proportion of acute respiratory conditions can be questioned. Seeing so many respiratory conditions diminishes the possibility of seeing other relevant conditions. Interventions aiming at seeing more low-exposure conditions can eventually be combined with seeing fewer acute respiratory conditions. By doing so, the risk that the trainees’ surgery hours cannot be filled is small, as 65.4% of the receptionists ‘never’ or ‘seldom’ found it hard to fill the trainees’ surgery hours, (unreported data belonging to the same questionnaire as in Chapter 6). In addition, diminishing the proportion of skin and musculoskeletal diseases seems less expedient, since the frequently encountered ICPC diagnoses (dermatomycosis, low back pain, see Table 2, Chapter 4 and Table 1, Chapter 5) are not encountered at the same scale as the acute respiratory conditions.
CHAPTER 6: REASONS FOR DISPARITIES; WHICH ASSIGNING BEHAVIOUR DO RECEPTIONISTS REPORT?

Main findings: To find an explanation for the disparities in patient mix between trainers and trainees, we studied the assigning behaviour of the medical receptionist. Almost all receptionists asked patients about their reason for consultation and the majority usually discussed which doctor would be seen. Receptionists were not inclined to assign a patient specifically to either the GP trainer or trainee. Most agreed with the statement that the patient mix of trainees and trainers is similar.

Interpretation and implications: Our findings suggest that most receptionists have at least some freedom when assigning patients. Their assigning strategy was not only passive (assigning any patient to any doctor), but they also reported intentionally assigning a varied patient mix to trainees. The findings in Chapter 6 are in contrast with most disparities in patient mix that we found in Chapters 4 and 5. An explanation for this can be that receptionists have limited insight into the kind of health problems that they assign; the reason for the encounter does not always correspond to the diagnosis that is made. For example, a sinusitis diagnosed in a patient presenting with headache or a depressed patient presenting with vague physical complaints. This explanation is confirmed by the results of the steering intervention (Chapter 7, see further); receptionists reported actively steering substantial numbers of skin conditions and, to a lesser degree, psychosocial conditions. This was not objectified by an increased patient volume in both steered categories. These findings also cast serious doubt on the insight receptionists have or can have on the resulting patient mix they assign. This was not found in all areas, because many receptionists reported to have a preference to assign ‘complex’ patients to the trainer and minor ailments to the trainee (Chapter 6), which is more or less confirmed by our findings in Chapter 5. It thus must be concluded that the receptionist does have some influence on the trainees’ patient mix in a few, but certainly not all, areas. Their insight into the resulting patient mix is, nevertheless, limited.

CHAPTER 7: IS IT POSSIBLE TO INTENTIONALLY STEER TRAINEES’ PATIENT MIX BY INSTRUCTING RECEPTIONISTS, TRAINERS, AND TRAINEES?

Main findings: We conducted a RCT to investigate whether a trainee’s patient mix could be actively steered. We carefully concluded that steering of skin conditions was possible. Although, in absolute number, only a non-significant trend could be observed, there was a higher percentual increase in the intervention condition com-
pared with the control condition. Comparatively, the volume of psychosocial-conditions seen did not increase, neither in absolute numbers nor proportionally.

**Interpretation and implications:** The striking contrast between the disappointing steering success and the intervention group receptionists’ perceptions of their own steering is commented on in the previous section. A major limitation was that the intervention had not been tailored to the learning needs of the individual trainee. Such an approach would require the development of multiple learning outcome instruments and this was not considered feasible in this study. Our untailored approach may have hampered the motivation of trainer and trainee for steering.

A second limitation concerned the relatively short duration of each intervention. One trimester was probably too short to see a major effect. Since a non-significant trend towards a higher volume of skin diseases was observed, extending the steering period might have revealed clearer results. It remains questionable, though, how long receptionists could be motivated to continue steering.

**DOES STEERING CONTRIBUTE TO BETTER LEARNING?**

**Main findings:** In Chapter 2, patient mix was found to be positively related to self-reported learning outcome. In Chapter 7, we studied whether this relationship could be demonstrated if the patient mix was actively steered. The learning effect of steering was assessed using self-efficacy and knowledge. However, as described before, active steering was not found to be entirely successful, despite a solid intervention. The higher percentual increase of skin diseases in the intervention group did not result in greater self-efficacy. For psychosocial conditions, a higher self-efficacy was found in the intervention group. Knowledge of psychiatric conditions neither increased between pre- and post-testing, nor between the intervention arms. In a regression analysis, patient volume was a significant predictor of both skin and psychosocial self-efficacy.

**Interpretation and implications:** These findings confirm, at least partly, the results of the systematic review (Chapter 2), that the volume of exposure was related to self-reported outcome measures (self-efficacy) but not to formal assessment (the knowledge test). The knowledge test was not part of the summative assessment, so preparation bias, in contrast to several studies in the review, was unlikely. Perhaps experience increases confidence more than competence,\(^{38-40}\) and the individual idea of being more competent by experience can be deceptive.
3. General educational implications for the GP specialty training

GENERALIZATION OF CLINICAL COMPETENCE AND MINIMUM STANDARDS OF CLINICAL EXPERIENCE

Earlier studies have shown the importance of content-specific knowledge.\textsuperscript{41} This may implicate that, ideally, trainees should be exposed to every thinkable health problem to be fully competent. This is practically impossible, so the question is which conditions should at least be encountered, and how often, to acquire competence? Clinical competences may generalize to other competences because they follow similar medical, biological, or psychological patterns.\textsuperscript{41;42} Because of the high diversity of diagnoses encountered in general practice, general diagnostic ability is indispensible. GPs must be able to diagnose, and start the initial treatment of diseases, without prior experience with each distinctive diagnosis.

Minimum requirements may be desirable for trainers, trainees and the training institute because they offer a grip on the quantity that has to be met to expect competence.\textsuperscript{43} They can be based on reference data or on consensus by experts in the medical educational/GP training field. However, learning growth curves have been shown to be individually different\textsuperscript{44} and exposure never guarantees competence – which must be assessed by other means. Minimum standards may, therefore, be helpful, but the opportunity to see more if needed must be left open, if the required competence is not yet reached.

Since indications of relative ‘over-exposure’ were found, one can also think of formulating maximum standards. The competence growth curve may have reached the flattened part, and additional cases would not contribute further to learning or may even compromise other areas of learning that should be covered. Optimally, the qualification requirements are composed of a portfolio consisting of the encountered patient mix in combination with theoretical and practical assessments.

COMPARING THE PATIENT MIX OF GP TRAINEES WITH TRainers OR NATIONAL MORBIDITY FIGURES

As explained in the introduction, relatively old studies and small-scaled studies indicated gaps in the patient mix of GP trainees and disparities between GP trainer and trainees.\textsuperscript{11-13,25-29,34-45} In Chapters 4 and 5, it is expounded that, based on the results of our large, longterm cohort study, the assumed disparities do indeed ex-
However, an identical patient mix was never explicitly aimed for at our training institute, and probably not elsewhere either. Disparities in the patient mix between trainers and trainees are relevant if they have implications for the competence development of the trainees. The optimal patient mix can be highly different between individual trainees due to earlier working experiences and differences in learning style, learning speed, and learning growth curve.

At the group level, the comparison between the patient mix of the trainees and trainers is informative with respect to the question as to what could be seen in average training practices. It is doubtful, however, whether the trainers’ patient mix is the best reference standard to compare the trainees’ patient mix, when investigating its appropriateness. Since the patients are shared between trainer and trainee, differences between them are often larger, when compared with national figures on the patient mix of the average GP. This last comparison would perhaps be more realistic when discussing under- and over-exposure. An attempt to do this was made in Chapter 5. Conclusions about these comparisons must be made cautiously, because the data, due to differences in extraction method, are not fully comparable.

**MONITORING AND STEERING THE PATIENT MIX OF GP TRAINEES**

In this thesis, it is shown that EPR-based monitoring provides insight into the patient mix of GP trainers and trainees. Our analyses were performed at the group level, but individual reports could provide specific feedback on many important aspects of the training that have educational value. This includes background numbers, number of telephone or face-to-face consultations and home visits, specific diseases (hypothyroidism, asthma, conjunctivitis) and clusters of disease (malignancies, chronic diseases), diagnostic measures (laboratory, radiology) and therapy (pharmacologic prescriptions, referrals). Continuous monitoring of the patient mix provides a tremendous amount of didactic possibilities. The black box the training practices were once (and still often are) in can be permanently opened. The actual experience of trainees, which can be seen as part of their portfolio, becomes available for evaluation.

Providing patient mix reports to trainers and trainees, will confront them with disparities from the earlier mentioned reference standards, based on averages or on consensus. If confronted with these disparities, trainers and trainees will start questioning whether their diagnoses are correct, whether they use the right ICPC
codes, whether the trainee sees enough patients, whether the training practice suits their learning needs, whether they should take part in the surgery hours of the NP more often, among others. This information thus increases awareness and will most probably lead to a variety of actions intended to tailor the patient mix to the learning needs of the trainee, aiming for an optimal amount of experience in the specific domains needed for their training.

Achieving this by active steering of the patient mix was only moderately successful as was shown in Chapter 7. Instead of steering as many patients as possible, as was the instruction of our interventions, future steering should be considered to be directed at target values which are then permanently monitored. Both trainer and trainee should be responsible for reaching the targets, the receptionist can be involved. In this way, cooperation is encouraged. The aim of the intervention then is clearer and the participants are probably more motivated for steering.

Considering the role of the receptionist, the finding that trainees see younger patients is relevant. If, for instance, it is desired that more chronic conditions are seen, it would be much easier to instruct receptionists to assign, to the trainee, patients of an age in which the chance of encountering the interventional condition (in this case, chronic conditions) is higher (e.g. 70+ years), than instructing the receptionist to assign more chronic conditions. This could also be implemented in training practices where the reason for the consultation is not commonly asked by the receptionist.

When a monitoring system is implemented, it will be interesting to study which of the various actions that will take place to balance a patient mix are most effective. The effect of the EPR-based data reports may be enhanced if (minimum) standards are required for finishing the training. The data could then be part of the trainee’s assessment and could be linked to examinations based on, for instance, entrustable professional activities (EPAs).52

Some conditions, such as diseases of the blood and blood-forming organs present infrequently, also to regular Dutch GPs.8;32 From an educational perspective, potential under-exposure in these areas is conceivable. In Chapter 2, it is argued that supervision is important for competence development.53;54 Hence, if it is not possible to increase the number of patients in these areas, special supervised sessions for low-exposure conditions should be considered; however, the effectiveness of this approach should be studied.
Training institutes can benefit from aggregated EPR-extracted information. The curriculum can be adjusted to the patient mix – and the gaps this contains. In addition, the teaching programme can be better adjusted to the actual patient mix. Trainees should build expert performance in the areas they will frequently encounter. For low-exposure areas, learning aims should be realistic, involving a minimum-competence package, concentrating on initial treatment and on not missing important diagnoses.

VALIDITY OF ICPC BASED PATIENT MIX DESCRIPTIONS

As explained in Chapter 3, patient mix descriptions based on EPR-derived data are valid for research and educational purposes. Many earlier studies use handwritten or digital logbooks that are intended solely for educational purposes and thereby subject to social-desirability bias. Extracted from EPR systems, our data were not biased by any threat of formal assessment and did not acquire actions apart from the usual patient care. We therefore believe that EPR-derived logbooks are superior to traditional logbooks that are kept separately.

The validity of the EPR-based derived logbooks is, however, compromised by the ICPC classification system they are built on, which was found to be insufficiently refined (Chapter 6). Not all GPs used the third ICPC digit which provides some more options for detailed classification. Furthermore, ICPC codes themselves do not reflect the stage of the disease or its severity. By agreement, ICPC codes are used at ‘the highest level of specificity’. This means that the choices for codes are, or should be, made conservatively, and, thus, information may be lost. The validity is also dependent on the diagnostic competence of the trainees and the adequacy of the attribution of the right codes to the diagnosis given. As already mentioned, not all co-morbidity and differential diagnostic considerations are reflected by the ICPC diagnosis.

Another major drawback is that the ICPC classification system was not developed for educational purposes. To obtain a better perception of the patient mix and to focus on the educational value, clusters of diseases can be useful. The only existing cluster we found appropriate for our descriptions was chronic diseases, composed by Knottnerus et al. More clusters were published but not appropriate for our data for different reasons (based on ICPC-2, no clear educational meaning). We experienced that the composition of meaningful educational clusters of disease was particularly challenging (Chapter 5).
Although all trainees were affiliated with the same training institute, we do not think that this influenced the results, as other studies in different times, scales, and areas have shown similar results.

The use of data from EPR systems combined with decision rules to aggregate the data logically and consistently can be of great educational value. However, some of these decision rules were based on pragmatic grounds. For example, if diagnosis codes were linked to episodes of care, the episode code was counted only if no other new diagnosis code was entered during that contact. The episode code was ignored if a newly entered ‘distinct’ diagnosis code was entered and linked to the episode code. This choice was made because, in the pilot study, it was found that the use of episode codes highly differed between participating trainers. If, in future studies, both the episode and the newly entered ‘distinct’ codes are counted separately, it could contribute to a better understanding of co-morbidity and consultation behaviour of, for instance, patients with complex or chronic diseases. Other choices we made concerning the decision rules were equally defendable, but also based on pragmatic grounds.

4. Recommendations for future research
Future studies should explore the possibility of minimum, maximum, and optimal standards for the exposure of several domains during GP specialty training. For this kind of research, a permanent monitoring system in combination with repeated competence assessments is desirable.

A further question is whether tailoring patient mix of individual GP trainees to their learning goals is effective for learning, and how this can be best effectuated. This way, the relationship between patient mix and learning outcome can be mapped out further, and the specific contribution of several aspects of patient mix to learning can be identified.

EPR-based monitoring has more meaning if the patient mix descriptions are based on meaningful educational clusters. There is, to date, no consensus on the composition of many of these clusters. Developing them is a challenge and it would, indeed, be interesting to study which of these clusters have educational meaning.

5. Final word
For decades it was presumed that the patient mix of GP trainees contained low-exposure areas which had potentially negative consequences for the trainees’ com-
petence development. This thesis provides insight into the black box in which the patient mix had been. The low-exposure areas have been identified. The implementation of a patient mix monitoring instrument offers the possibility of tailoring the patient mix to the individual needs of GP trainees and the opportunity to answer many educationally relevant research questions.
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