Family Practice 2011; **0**:1–16
doi:10.1093/fampra/cmr098

An international comparative family medicine study of the Transition Project data from the Netherlands, Malta and Serbia. Is family medicine an international discipline? Comparing incidence and prevalence rates of reasons for encounter and diagnostic titles of episodes of care across populations

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Received 9 May 2011; Revised 28 September 2011; Accepted 30 September 2011.

Introduction. This is a study of the epidemiology of family medicine (FM) in three practice populations from the Netherlands, Malta and Serbia. Incidence and prevalence rates, especially of reasons for encounter (RfEs) and episode labels, are compared.

Methodology. Participating family doctors (FDs) recorded details of all their patient contacts in an episode of care (EoC) structure using electronic patient records based on the International Classification of Primary Care (ICPC), collecting data on all elements of the doctor–patient encounter. RfEs presented by the patient, all FD interventions and the diagnostic labels (EoCs labels) recorded for each encounter were classified with ICPC (ICPC-2-E in Malta and Serbia and ICPC-1 in the Netherlands).

Results. The content of family practice in the three population databases, incidence and prevalence rates of the common top 20 RfEs and EoCs in the three databases are given.

Conclusions. Data that are collected with an episode-based model define incidence and prevalence rates much more precisely. Incidence and prevalence rates reflect the content of the doctor–patient encounter in FM but only from a superficial perspective. However, we found evidence of an international FM core content and a local FM content reflected by important similarities in such distributions. FM is a complex discipline, and the reduction of the content of a consultation into one or more medical diagnoses, ignoring the patient's RfE, is a coarse reduction, which lacks power to fully characterize a population's health care needs. In fact, RfE distributions seem to be more consistent between populations than distributions of EoCs are, in many respects.

Keywords. Epidemiology, episode of care, electronic medical record, electronic patient record, family medicine, general practice, ICPC, incidence, international, International Classification of Primary Care, longitudinal, Malta, person-centred care, prevalence, reason for encounter, Serbia, the Netherlands, Transition Project.

Introduction

The development of family medicine (FM, synonymous with general practice) as a clinical speciality and an academic discipline is informed and enhanced by the collection of empirical longitudinal data from routine clinical practice. The study of the epidemiology of FM using electronic medical record (EMR) databases is a classic example, recommended by the European Research Agenda for Primary Health Care and General Practice for empirically and longitudinally measuring the content of actual practice and patient outcomes

and informing the domains of research, education, policy and clinical practice.[1,2]

Such data allow research into the 'international discipline of FM', a fundamental premise for the existence of the World Organisation of Family Doctors (Wonca).[3] Although many authors have studied FM in national and international studies, few international comparisons studied the actual core content of family practice. Patients' symptoms and the diagnostic process have been studied even less than morbidity patterns and interventions.[1,2,4–10] Thus, there are important gaps in our understanding of the international core content of FM.

The importance of morbidity registration, the collection of routine data from FM and research into the process of diagnosis has been amply illustrated by the seminal work of Henk Lamberts and Maurice Wood,[4,5,11] emphasized by the Institute of Medicine's (IOM) Report on the Future of Primary Care in the United States of America[6] and more recently by the European General Practice Research Network's (EGPRN) European research agenda for FM.[2,7] The developing field of decision support systems for medical diagnosis depends on the availability of such data.

A number of longitudinal EMR datasets collected from the daily practice of family doctors (FDs, synonymous with GPs) are available to researchers, including large databases collected from the Netherlands, the UK and Australia. Most of these databases collect information on diagnosis and are encounter-based. However, practices providing such data are not necessarily representative of all practices within a geographical region or health care system.[1] Inter-doctor and inter-practice variations have effects which should be considered in the interpretation of such data.[10,12] Few projects systematically collect data on the patient's 'reason for encounter' (RfE; see Methodology) and structure data in the form of 'episodes of care' (EoCs; see Methodology).[13] Such data elements would allow the structuring of data within an appropriate ordering principle and greatly enhance their usefulness for research. As we have demonstrated previously, data that are not collected within an episode-based model are less able to precisely characterize incidence and prevalence rates.[14]

A notable exception is the set of databases collected by The Transition Project (www.transitieproject.nl),[9] a foundation set up in the Netherlands by Henk Lamberts and collaborators to study the epidemiology of EoCs in FM. The project collects data from participant practices through a specially designed EMR, where doctors record details of patients' RfEs, their interventions and the diagnostic titles of EoCs, within an EoC data structure. The Transition Project databases thus fulfil the recommendations of the international standard for data collection in primary health care, the 'International Classification of Primary Care' (ICPC) and have therefore been used for this study.[11]

ICPC acts as an ordering principle for FM data, allowing for direct comparisons, and also has the appropriate granularity for primary care.[14] Data have been collected in the Netherlands, Japan, Poland, Malta, Serbia and other countries[1,4,8,9,15,16] from the daily practice of a cohort of FDs using similar methodology over a period of time (from 1 to 11 years). These data allow the calculation of incidence and prevalence rates per 1000 patient years of observation in a population, this being a controlled denominator independent of consultation rates. The datasets from the Netherlands, Malta and Serbia have been used for this study since they are available and validated, recent and overlap in time.

This study aims to support the academic development of FM through the analysis of the epidemiology of FM using a set of longitudinal clinical databases, collected as part of the Transition Project.[9] This paper shall focus particularly on incidence and prevalence rates of RfEs and episode titles.

In view of the significant socio-cultural, economic and health care system differences between the three countries involved (see below), it is to be expected that patient needs and disease patterns will be different between these patient populations.[2,10,17] However, the local core content of FM in these countries could be expected to be similar, due to the influence of an international discipline of FM. The study of similarities and differences in these practice populations thus informs the discussion on the existence of an international academic base for FM as a clinical discipline.

Research questions

- What is the content of general practice/FM as characterized by databases collected from the routine care of selected practice populations in Malta, the Netherlands and Serbia and as characterized by the distributions of RfEs, interventions and diagnoses within EoCs?
- What are potential explanations for apparent similarities and differences in the distributions of RfEs, interventions and diagnoses, within EoCs in these practice populations?
- Notwithstanding such differences, if any, what are the generic similarities in the content and practice of general practice/FM in these practice populations and do these similarities support the existence of an international discipline of FM?

Methodology

Setting

The Maltese health care system provides publicly financed primary and secondary care free at the point of use. It is an integrated national health service, supplemented by a strong private health care sector. Parliament enacts health care legislation and approves

the health care budget, while the Ministry of Health acts as a regulator.

The Maltese FD typically works single-handed in private practice, charging a fee for service or less commonly as a salaried member of a group practice manning one of six government health centres. Access to both private and state systems of PHC delivery is open to all, and 80% of the population choose the former as their first choice, even though they still subsidize the latter through taxation. One of the reasons for this choice is the improved continuity of care available when seeing a private FD, but patients often also use the health centre for repeat prescriptions or minor complaints. There is currently no formal system for patient registration with an FD in Malta, but such a system is under discussion, and FDs have a limited gatekeeper role.[18] The Maltese Transition Project database was collected by author JKS from volunteer self-employed FDs.

The Netherlands has an insurance-funded health care system, with primary care doctors and other health care organizations negotiating private contracts and budgets with various health insurers. The population enjoys nearly universal health insurance coverage through a combination of private and public insurance. An obligatory national insurance covers all basic care (primary and secondary) for all citizens, with subsidies on the premia available for low-income citizens. While most FDs currently work in private practice, on a solo basis or in small group practices, the number of large group practices is growing. FDs are paid a capitation fee per patient and a fee per consultation, plus a negotiated reimbursement depending on service costs, number of staff employed and quality and efficiency indicators. FDs act as gatekeepers to hospital and specialist care.[19] The Dutch database was collected by authors HL, IO, SO and KvB.

In Serbia, the Transition Project initially collected data in a collaborative project with the International Committee of the Red Cross (ICRC) for 1 year (2003) in the Kraljevo area, near the border with Kosovo. The region has been contested by different political and religious groups since the times of the Ottoman Empire. The region was severely affected by wars at the end of the 20th century, with the local economy (including a major car and truck factory) being destroyed by North Atlantic Treaty Organization bombs, many people being killed and a large influx of Serb refugees into the region from Kosovo at the end of hostilities. The region is relatively poorer than Malta and the Netherlands, and people tend to have lower levels of education. Around 50 FDs were provided with training, resources and support by the ICRC and given money to develop an EMR system based on ICPC. This project ran for 3 years to kick start primary care in Serbia and especially in the Kraljevo region. Single-handed FDs, most with a practice nurse, were specially recruited for the programme rather than volunteered for research purposes as in Malta and the Netherlands.[20,21] Residents >15 years of age were registered with the FDs, who cared for all health problems except gynaecology. The Serb database was collected by a team including authors PZ and MJ.

Data

The public domain EMR TransHis,[22] designed for use with ICPC, was used to collect data from participating FDs, who recorded details (RfE, diagnosis/es and intervention/s) of all their patient contacts in an EoC structure using ICPC. RfEs presented by the patient, all FD interventions and the diagnostic labels recorded for each encounter were classified with ICPC (ICPC-2-E in Malta and Serbia and ICPC-1 in the Netherlands).

Data elements

The content of family practice is expected to differ more due to system effects and less due to actual inter-doctor variation.[10,12] For the purposes of this study, FM content is measured according to an international standard, the ICPC, as described below.[11]

An EoC is defined as a health problem from its first presentation by the patient to the FD, until the completion of the last encounter for it. It encompasses all contact elements related to that health problem. Its name (i.e. the diagnostic label of the EoC) may be modified over time, and in this article, we refer to it as the 'episode title'. The last diagnosis made during an EoC is the current episode title.[9,11]

The RfE(s) is defined as an agreed statement of the reason(s) why a person enters the health care system, representing the demand for care by that person. The RfE should be recognized by the patient as an acceptable description of the demand for care.[9,11] Doctors recording data for the Transition Project were trained to record RfEs according to the definitions above, reflecting the patient's understanding as expressed. Symptoms elicited during history taking (i.e. history of the presenting complaint) were recorded in a separate cell in the EMR Transhis and were not used for the analyses in this study.

ICPC has a biaxial structure, with 17 chapters on one axis and 7 components on the other. Chapters are based on body systems, with an additional chapter for psychological problems and one for social problems.[11] Each chapter is identified by a single alphabetic code, which is the first character of all rubrics belonging to that chapter. Each chapter is divided into seven components, identified by a range of two digit numeric codes. Component 1 codes symptoms and complaints, while Component 7 codes diseases. A RfE can be either a symptom (Component 1) or a disease (Component 7) when a patient presents with the RfE such as 'doctor, I have migraine'. Conversely, an EoC may have a disease label diagnostic title or it may be labelled with

a Component 1 'symptom' diagnosis, such as when the FD cannot be more precise than label an EoC with the title 'shortness of breath'. Components 2–6 deal with interventions and can be used to code an RfE that is presented as a request for an intervention.[11]

Population and databases

The databases encompass a defined time period: an average of 9896 patients and 43 577 patient years of observation over 5 years in Malta (2001–2005), 15 318 patients and 158 370 patient years over 11 years in the Netherlands (1995–2005), 72 673 patient years over 1 year in Serbia (2003). The practice populations in the Netherlands and Serbia represent registered patient populations (the Serbs only those >15 years of age), while the population in Malta represents patients consulting over a 5-year period. The databases were analysed using a 1-year data frame. An EoC open over a number of years of observation would be re-coded as rest-prevalent (to distinguish it from new) in subsequent years, but only for those years when a consultation for that same EoC occurred.

Analysis

The databases were used to calculate population characteristics, utilization rates and incidence and prevalence rates for both RfEs and EoCs. Interventions were analysed as aggregated rates, and not by individual codes, since the distribution of such codes is very narrow (in fact, >90% of interventions in the Dutch database are described by only five codes).[9] Distributions of ICPC utilization, population demographics and an extended comparison of incidence and prevalence rates for less common diseases were also analysed. The data included is an example of the extensive data, which can be output from the Transition Project, limited to these sets in the interest of brevity.

All encounter data (face-to-face encounters in the office and at home, telephone consultations, repeat prescriptions, etc.) were analysed to obtain complete data on incidence and prevalence, including patients presenting for a repeat prescription only. All prescriptions were coded with the Anatomical Therapeutic and Chemical (ATC)[23] and ICPC drug classifications [including information on prescribed defined daily doses (DDDs)].

Rates are presented as 'number of observations per thousand person (patient) years of observation'. A patient year starts when a patient registers in the practice and is closed when the patient leaves the practice for any reason, including death. In the case of Malta, where patients are not registered with the FD, but tend to see the same FD for most, but possibly not all, health care problems, a patient year was opened when a patient presented to the FD for an encounter. Any patients in the Maltese database who did not consult in the observation period of 5 years did not contribute to the denominator.

Incidence rates in this study give the rate of an observation in new EoCs, i.e. at an encounter at the start of a new EoC, per thousand patient years of observation. Prevalence rates give the rate of an observation in all EoCs, both incident and rest-prevalent considered together, in that period of observation. Rest-prevalent EoCs represent a health problem that is not new but has presented during a period of observation for follow up of that problem. A patient can have more than one new EoC for the same diagnosis during an observation period (say two separate EoCs for bronchitis in 1 year) and/or may present with the same RfE more than once in an observation period. However, the same RfE cannot be coded more than once per encounter per EoC.

Rates of RfEs and EoCs were standardized to the European Union standard 25 country population (EU25 population)[24] to adjust for age and sex differences in the practice populations under study. Age was calculated at the middle of the observation frame (middle of each year of observation and 1 year data frame). The practice populations were treated as defined populations and not as samples of a larger population.

The distributions were ranked according to new RfEs (new presentations of symptoms and requests) and all EoC titles (the 'burden of disease' and health problems in these populations), to include the joint top 20 ranks in all three populations. The largest (Dutch) database was used to rank the tables.

Ethical approval

The study did not involve the collection of new data. Ethical approval was applied for locally, when appropriate, for individual studies based on these data in the Netherlands, Serbia and Malta.

Results

We would suggest that a printed copy of all ICPC rubrics and short text labels might be useful while reading the results and discussion sections below. Such two-page documents are freely available in many languages from the Wonca website (http://www.globalfamilydoctor.com/wicc/pagers.html).

Databases

Table 1 gives the characteristics of the three population databases and illustrates their considerable size and detail. Empty cells represent data, which are missing or not available, reflecting practical difficulties in extracting prescription, referral and test result data from the custom Serb EMR, and test results from Malta. The Dutch database is largest, with >1.3 million RfEs and over half a million EoCs in 850 000 encounters, and it covers the widest time interval. There are proportionately less subencounters and new EoCs in the Serb

TABLE 1 *Characteristics of the three population databases*

1 year data frame databases	Netherlands	Malta	Serbia
Observation period	1995–2005	2001–2005	2003
Patients (cumulative over period)	168 497	49 479	72 673
Patient years denominator	158 370	43 577	72 673
Encounters	838 896	70 177	207 323
Subencounters/diagnoses	1 178 178	93 606	405 150
RfEs	1 326 920	131 537	363 520
RfE in new EoCs	422 568	82 224	34 828
EoC	554 804	75 450	103 133
New EoC	337 348	55 821	41 172
Interventions	1 605 345	201 132	387 468
Prescriptions	810 894	54 352	–
Measurements and/or test results	252 812	–	–
Referrals primary care	28 822	859	–
Referrals specialist	38 250	3 928	–
Years of observation	11	5	1
Number of doctors	10	9	50
Practices	5	4	50

Empty cells represent data that are missing or not available. 'Patients (cumulative over period)' refers to the average number of patients observed each year in turn, each then summed up for the entire period. 'Subencounters/diagnoses' refers to the number of diagnoses dealt with in subencounters (the part of an encounter which deals with one single EoC). An encounter may have several subencounters. 'New EoC' refers to the epidemiological status of an EoC, a new EoC being incident in the observation period. An EoC is rest-prevalent ('roll-over') if it already existed before the observation period and was followed up within the period. New and rest-prevalent episodes together thus form the prevalent episodes in a registration period, and this total is given in the cell referred to as EoC. 'Referrals primary care' includes referrals to non-specialist colleagues (e.g. physiotherapist, podologist). Other terms are self-explanatory.

database, which is also notable in that it includes more individual patients (~72 673) and represents data from 50 FD practices.

Population age–sex distributions

Figure 1 gives the cumulative age–sex distributions of the populations under study (numbers of patients in an age–sex band for each cumulative year of observation). The Serb population exhibits a shift towards more females and less children.

Denominator and utilization

Table 2 gives derived (calculated) parameters of the three population databases. The average patient population in the three databases is calculated to be 15 318 Dutch, 9896 Maltese and 72 673 Serb patients. The number of patient years of observation is slightly less than the number of patients for each database, except for the Serb figure for 1 year of observation.

The Maltese database contains relatively fewer encounters per patient year than the others and also fewer prescriptions than the Dutch, but the rate of subencounters per encounter is similar to the Dutch datum. The Dutch data contain more EoCs and diagnoses per patient year, and the Dutch FDs tended to code relatively more encounters, RfEs, EoCs, interventions and prescriptions. The Dutch and Maltese FDs tended to record multiple RfEs for each new EoC, in contrast to the Serbs FDs who coded more interventions per year and per EoC. This trend is also evident in the numbers of RfEs in general, with Serb doctors tending to record more RfEs per patient year than their Maltese counterparts, but proportionately fewer of those in new, as against rest-prevalent, EoCs (i.e. those EoCs opened before a particular year of observation and followed up during that said year). Referral rates are low, at 1 every 10 patient years in Malta and 4 per 10 patient years in the Netherlands (primary and secondary care referrals considered together).

Coding

Table 3 describes coding with ICPC in each of the three databases. The Dutch FDs used a larger number of different ICPC rubrics in coding both RfEs and EoCs and used almost all the available ICPC rubrics at least once between them, including ICPC drug classes across prescribed drugs. The Maltese FDs also demonstrated broad utilization of rubrics, in contrast to the Serb FDs. With regards to coding RfEs, the 20 most utilized rubrics in the Dutch and Maltese databases (the top 20) cover around two-thirds of the entire distribution of presented RfEs. The Serb data are less diverse, with >80% of all RfEs being coded by 20 rubrics. The situation is slightly different with EoCs, where the Dutch again exhibit the widest diversity (the top 20 rubrics used for EoCs only cover one-third of the distribution), while the Maltese and Serb top 20 rubrics describe just over half of the distribution.

Distribution of RfEs

Table 4 lists the top 20 new RfEs in the three databases. The 20 most commonly coded RfEs in new EoCs in each of the three databases are presented, i.e. RfEs in incident EoCs. Thirty-six rubrics are sufficient to describe the common distribution of the three populations.

The Serb rates of incident, but also prevalent, RfEs tend to be lower than the other two sets, and this will influence other comparisons. The Serb data also exhibit less diversity of coding by FDs, as reported above. In fact, the top 20 rubrics describe a larger proportion of the general distribution in the Serb data. In particular, skin problems (Chapter S in ICPC), other localized abdominal pain (D06), earache (H01) and vomiting (D10) seem to be far less common as Serb RfEs. In contrast, the prevalence of neck complaints (L01), feeling anxious (P01), respiratory pain and angina (R01 and P01) expressed as symptoms (prevalent RfEs) in the Serb database appear high in comparison with the other two populations. In the Netherlands, tiredness (A04) and low back pain (excluding radiation, L03)

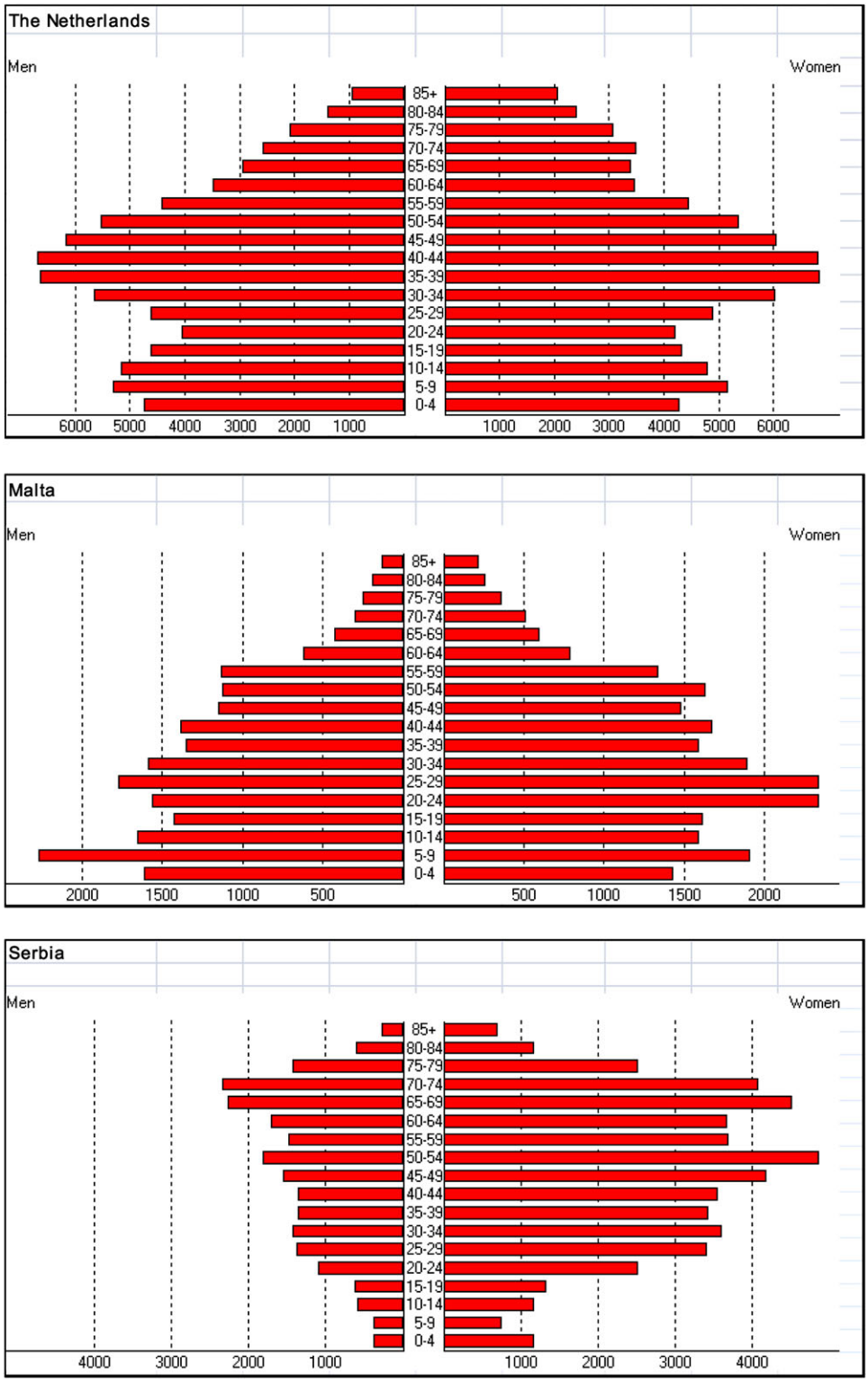

FIGURE 1 *Cumulative sex–age distributions of the practice populations in the Netherlands, Malta and Serbia, respectively. Numbers represent cumulative populations calculated year by year (1-year data frame)*

appear to be at least twice as prevalent as in the other two datasets and incidence is also high. Additionally, shortness of breath (R02), hearing complains (H02) and most musculoskeletal RfEs also appear to be more common in the Dutch database. All respiratory symptoms and many symptoms associated with acute viral illness (e.g. fever and gastrointestinal symptoms) exhibit high incidence and prevalence rates in Malta,

TABLE 2 *Derived parameters of the three population databases*

Derived parameters	Netherlands	Malta	Serbia
Patients (average/year)	15 318	9896	72 673
Patient years (average/year)	14 397	8715	72 673
Encounters per patient year	5.3	1.6	2.9
Subencounters per encounter	1.4	1.3	2.0
Diagnoses per patient year	7.4	2.1	5.6
New diagnoses per patient year	2.1	1.3	0.6
EoCs per patient year	3.5	1.7	1.4
New EoCs per patient year	2.1	1.3	0.6
RfEs per patient year	8.4	3.0	5.0
RfEs per EoC	2.4	1.7	3.5
New RfEs per patient year	2.7	1.9	0.5
RfEs per new EoC	1.3	1.5	0.8
Interventions per patient year	10.1	4.6	5.3
Interventions per EoC	2.9	2.7	3.8
Primary care referrals per patient year	0.2	0.0	–
Specialist referrals per patient year	0.2	0.1	–
Prescriptions per patient year	5.1	1.2	–
Prescriptions per EoC	1.5	0.7	–

Empty cells represent data that are missing or not available. 'Patients (average per year)' is the average number of patients listed in the database per year of observation (the number of listed patients divided by the number of years of observation). 'Patient years (average per year)' is the average number of patient years per year of observation. It is the result of correcting the actual number of listed patients for the actual time that each listed patient was registered with the practice, so that a patient year in fact counts 365 days. 'Encounters per patient year' is the number of doctor–patient encounters divided by the number of patient years. 'Subencounters per encounter' represents the average number of EoCs (diagnoses) managed per doctor–patient encounter. A subencounter represents the part of an encounter that deals with one single EoC. An encounter may thus have several subencounters. 'Diagnoses (synonymous with subencounters in this context) per patient year' represents the number of diagnostic labels (or subencounters) per patient year. 'New' diagnoses are those incident in the observation period. 'EoCs per patient year' and 'new EoCs per patient year' represent the rate of all EoCs, and new EoCs (respectively), per patient year. 'RfEs per patient year' is the rate of RfEs per patient year, while 'RfEs per EoC' is the average number of RfEs presented per EoC. New RfEs are those that are recorded at the start of a new (or incident) EoC. The last six rows represent rates of interventions, referrals and prescriptions per patient year or per EoC.

while epigastric pain (D02) is relatively less common than may be expected from this general trend.

Requests for interventions were ignored in calculating these distributions, so as to focus on symptoms rather than requests for the FD to perform a specific intervention. However, the proportion of RfEs formulated as requests for interventions, which are excluded from the tabulated data, are given at the foot of Table 4. In the Serb database, they represent 57% of all RfEs, as against 38% and 20%, respectively, in the Dutch and Maltese databases.

Distribution of episode titles

Table 5 lists the top 20 episode titles in the three databases, i.e. the 20 most commonly coded EoCs in each of the three databases are presented. Episode titles exhibit more diversity than RfEs. In fact, 41 labels are necessary to describe the top 20 distributions of EoCs, as against only 36 for RfEs.

In Malta, EoCs for respiratory and other acute viral illnesses, especially upper respiratory tract infections (URTI, R74), exhibit relatively higher prevalence and incidence rates when compared to the other two databases. Gastroenteritis (D73), muscle pains (L18) and tobacco abuse (P17) are also more prevalent, and incident, in the Maltese database, while cystitis (U71) is relatively less common. The Dutch data show remarkably high incidence and prevalence rates for EoCs of family planning/contraception (W11) and sleep disturbance (P06), musculoskeletal (L) and skin (S) problems, ear wax (H81), tiredness (A04) and anxiety (P01) and slightly less so for cystitis (U71). In the Serb dataset, there are fewer EoCs of prevention (A98) and 'no disease' (A97, usually coding an administrative encounter for the filling of paperwork or forms only), drug adverse effects (A85) and depression (P76) and fewer skin (ICPC Chapter 'S') and respiratory ('R') EoCs. In contrast, there are relatively high rates for

TABLE 3 *ICPC utilization in the three databases*

ICPC rubric usage	Netherlands (%)	Malta (%)	Serbia (%)
Number of rubrics as RfEs	711 (98)	594 (82)	470 (65)
Number of rubrics as new RfEs	698 (96)	520 (72)	401 (55)
Number of rubrics as episode titles	684 (100)	618 (90)	610 (89)
Number of rubrics as new EoC titles	680 (99)	589 (86)	594 (87)
Number of rubrics as interventions	38 (100)	40 (100)	40 (100)
Number of ICPC drug classes used	266	188	–
Total Top 20 RfE	875 076	83 395	300 707
%Age of total distribution	65.95	63.40	82.72
Total top 20 EoC	178 516	38 709	57 828
%Age of total distribution	32.18	51.30	56.07

The number of rubrics (codes) used by the participating FDs to code RfEs in all EoCs, RfEs in new EoCs, diagnostic labels in EoCs and new EoCs, interventions (process) and ICPC drug classes, respectively, are given in the first six rows. The percentages in brackets represent the percentage of all possible rubrics actually utilized at least once by the group of coding FDs. The next two rows represent the number of RfEs, which are coded by the 20 most common rubrics in each population, and the percentage these represent from the total distribution of RfEs. The last two rows represent the number of EoCs coded by the 20 most common rubrics in each population, and the percentage these represent from the total distribution of EoCs. Note that requests for interventions (RfEs in Components 2–7 of ICPC) were excluded from the calculations of RfE distributions.

TABLE 4 *The top 20 new RfEs in the three databases*

Nl			Nl incidence		Nl prevalence		Mt	Mt incidence		Mt prevalence		Sb	Sb incidence		Sb prevalence	
Rank	Code	Label	*p1000py*	*EU 2005*	*p1000py*	*EU2005*	Rank	*p1000py*	*EU 2005*	*p1000py*	*EU2005*	Rank	*p1000py*	*EU 2005*	*p1000py*	*EU 2005*
1	R05	Cough	121.8	119.7	164.8	162.2	1	188.9	167.8	243.5	219.5	1	33.7	32.0	164.9	147.4
2	A03	Fever	58.2	55.2	71.5	68.0	4	114.8	92.9	130.6	106.3	12	5.1	5.4	16.4	15.7
3	S06	Local redness/erythema/rash	56.7	56.2	70.6	70.2	10	31.7	30.6	38.2	37.4	39	1.9	1.7	3.7	3.0
4	R21	Symptom/complaint throat	50.6	50.8	61.2	61.5	2	168.0	150.3	184.2	165.0	2	18.6	20.1	55.8	58.4
5	A04	General weakness/tiredness	49.5	49.8	76.4	77.1	14	23.8	26.2	34.0	40.2	17	4.0	3.3	45.5	32.3
6	S04	Local swelling/papule/lump/mass	47.9	48.2	54.9	55.3	20	15.0	15.3	17.7	18.4	33	2.4	2.2	4.7	4.1
7	L03	Low back complaint excl radiation	46.0	46.9	75.6	77.1	34	8.6	9.4	13.3	15.2	14	4.9	3.9	56.7	41.9
8	D06	Other localized abdominal pain	37.9	38.2	60.9	61.6	7	37.9	37.7	50.0	51.9	27	2.7	2.3	8.2	6.4
9	H01	Ear pain/earache	36.1	34.5	43.3	41.4	8	37.8	32.4	42.4	36.5	16	4.2	3.9	11.7	10.4
10	N01	Headache (excl N02 N89 R09)	35.8	36.0	53.2	53.5	9	32.4	30.7	45.0	44.3	6	7.2	6.4	51.4	39.3
11	R02	Shortness of breath dyspnoea	33.0	33.1	71.3	72.0	27	10.3	11.7	21.8	26.4	33	2.4	2.1	20.6	15.5
12	L08	Shoulder symptoms/complaints	31.7	32.4	49.8	50.9	28	9.9	11.5	13.6	16.5	46	1.6	1.4	9.7	7.6
13	L17	Foot and toe symptoms/complaints	31.1	31.5	41.4	42.0	21	14.7	16.8	19.4	23.1	59	1.0	0.9	3.9	3.0
14	L15	Knee symptoms/complaints	30.5	31.1	48.6	49.8	24	12.5	13.9	17.7	20.8	28	2.7	2.3	16.5	12.6
15	S02	Pruritus	29.2	29.3	41.7	42.0	19	16.0	15.2	20.3	19.7	11	5.7	5.1	14.7	11.4
16	R74	URI (head cold)	28.8	28.4	34.4	33.9	40	5.9	5.8	8.0	7.7	111	0.3	0.4	0.6	0.6
17	L01	Neck symptom/complaint excl headache	28.5	28.8	43.6	44.2	18	16.6	16.5	21.5	22.2	4	8.6	6.9	97.8	68.7
18	L14	Leg/thigh symptoms/complaints	27.8	28.6	45.1	46.5	22	13.4	16.3	20.1	26.1	35	2.2	1.9	15.4	11.5
19	H02	Hearing complaints excl H84)	27.6	27.8	36.4	36.6	51	4.7	5.2	6.1	6.9	36	2.2	1.8	3.6	2.8
20	L04	Chest symptoms/complaints	25.1	25.7	35.4	36.2	16	21.1	24.0	28.1	32.7	26	2.8	2.7	16.2	12.3
21	N17	Vertigo/dizziness	24.1	24.8	38.0	39.0	15	23.8	26.4	34.2	39.3	21	3.4	2.4	14.9	10.2
22	D11	Diarrhoea	22.2	21.9	29.8	29.5	6	41.1	37.7	47.2	44.2	13	5.0	5.1	12.5	12.3
26	U02	Urinary frequency/urgency	17.5	17.8	22.4	22.9	36	7.4	8.3	9.4	10.9	15	4.8	4.0	20.1	14.6
27	U01	Dysuria/painful urination	17.3	17.6	21.5	21.9	25	11.4	11.5	13.6	14.2	9	6.0	4.8	27.0	21.1
28	D09	Nausea	17.1	17.4	24.6	25.0	13	27.0	25.8	33.0	32.4	25	2.9	2.7	9.8	8.3
29	L02	Back symptom/complaint	16.9	17.3	24.8	25.2	12	27.6	29.9	37.1	41.7	5	8.0	7.1	58.0	43.6
34	D10	Vomiting	15.0	14.5	20.0	19.4	5	41.7	35.1	47.2	40.5	42	1.7	1.9	4.6	4.3
35	D01	Abdominal pain/cramps general	14.9	14.7	24.5	24.3	11	29.1	26.7	36.0	34.2	7	6.7	6.2	40.5	33.2
36	P01	Feeling anxious/nervous/tense	14.7	14.9	30.8	31.4	29	9.8	10.8	25.8	29.4	8	6.2	5.0	80.5	58.9
39	F02	Red eye	13.3	13.3	15.3	15.3	26	10.6	9.8	12.3	11.4	18	3.8	3.4	8.2	6.9
41	D02	Abdominal pain epigastric	12.3	12.5	20.6	21.0	58	3.7	4.0	5.6	6.5	10	5.8	4.9	32.1	25.9
53	R07	Sneezing/nasal congestion	9.2	9.2	12.7	12.7	3	135.1	113.8	157.7	133.7	52	1.2	1.2	3.3	3.6
75	S07	Rash generalized	6.0	5.7	7.2	6.9	17	17.0	13.9	20.7	17.0	100	0.3	0.4	0.6	0.6
78	K02	Pressure/tightness of heart	5.5	5.7	10.8	11.2	122	1.1	1.6	2.1	3.2	19	3.5	2.9	69.7	51.7
123	A05	Feeling ill	3.5	3.6	8.6	8.7	154	0.7	0.8	0.9	1.2	20	3.4	2.9	10.4	7.9
129	R01	Pain respiratory system	3.2	3.3	4.5	4.5	82	2.2	2.3	2.9	3.0	3	12.8	11.3	94.4	80.9
36 ranks		Total RfE 2–6 (p1000py)	2048.1		3295.3			1549.6		2043.8			281.8		1767.5	
Proportion Rfe 2–6 of top 20 distribution (*N*)			Rfe 2–6	T20 RfE				RfE 2–6	T20 RfE					RfE 2–6	T20 RfE	
			65 356	170 939	38%			10 745	52 616	20%				13 061	22 815	57%

Nl, Netherlands; Mt, Malta; Sb, Serbia. The 20 most commonly coded RfEs in new EoCs in each of the three databases are presented, i.e. RfEs in incident EoCs, 36 rubrics describing the common distribution of the three populations. Requests for interventions were ignored in calculating these distributions. The incidence rate (rate of that RfE per 1000 patient years at the beginning of a new EoC) and also the prevalence rate (rate of that RfE per 1000 patient years at any encounter during an EoC, i.e. all instances of that RfE) of the 36 RfE rubrics (presented as a disease label or symptom, i.e. ICPC Components 1 and 7, requests for interventions not included) are given. Rates are expressed per 1000 patient years of observation, both unadjusted and also adjusted for age and sex to a standardized EU 25 country population. The ranking of each rate in the three respective populations is given (according to their rank in incidence), and the rubrics are ranked according to the Dutch distribution (ranking in first column). The proportion that Components 2–6 rubrics (representing requests for interventions which were not included in this distribution) would contribute to the distribution of the 20 most common new RfEs in each population is also listed for the purpose of comparison. 'Rank' gives the rank of that rubric in the distribution of incident (new) RfEs in that population. 'Code' gives the ICPC code. 'Label' gives the ICPC-2 text label for that rubric. 'Incidence' gives the rate of observation of that rubric as a RfE in new EoCs (both unadjusted and adjusted for age and sex against the EU-25 population). 'Prevalence' gives the rate of observation of that rubric as a RfE in all EoCs (both unadjusted and adjusted for age and sex against the EU-25 population). 'Total RfE' gives the total rate of all RfEs (excluding requests for intervention, Components 2–6 of ICPC), incident and prevalent, per 1000 patient years. 'Proportion RfE 2–6 of total distribution (*N*)' gives the percentage proportion that RfEs formulated as a request for intervention ('RfE 2–6') represent of the entire top 20 new RfEs ('T20 RfE').

TABLE 5 *Lists the top 20 EoCs (episode titles) in the three databases*

Nl			Nl Prevalence		Nl Incidence		Mt	Mt Prevalence		Mt Incidence		Sb	Sb Prevalence		Sb Incidence	
Rank	Code	Label	*p1000py*	*EU 2005*	*p1000py*	*EU2005*	Rank	*p1000py*	*EU 2005*	*p1000py*	*EU2005*	Rank	*p1000py*	*EU 2005*	*p1000py*	*EU 2005*
1	A98	Prevention	171.4	175.6	97.9	99.0	2	111.6	131.8	90.4	107.7	50	5.3	4.6	4.5	3.9
2	W11	Family plan/oral contraceptive	93.0	93.7	12.6	13.1	127	2.3	–	1.5	–	–	0.0	–	0.0	–
3	K86	Uncomplicated hypertension	75.7	79.2	5.3	5.5	7	41.1	59.9	4.6	6.2	1	114.1	79.8	19.3	14.4
4	S88	Contact dermatitis/other eczema	59.9	60.3	32.1	32.2	39	7.8	7.0	6.9	6.2	44	6.2	5.1	4.4	3.8
5	P06	Disturbances of sleep/insomnia	57.9	59.8	17.2	17.5	81	3.8	5.9	1.1	1.5	51	5.2	3.5	2.1	1.5
6	U71	Cystitis/other urine infection NOS	57.5	59.0	48.9	50.2	21	17.1	17.6	15.2	15.5	6	49.5	36.5	25.9	19.6
7	L03	Low back complaint excl radiation	55.7	56.9	41.0	41.7	90	3.5	3.7	2.6	2.8	43	6.4	4.7	2.5	2.0
8	R74	URI (head cold)	53.7	52.4	50.5	49.2	1	205.7	177.3	202.0	174.1	2	99.5	92.5	47.2	44.6
9	R05	Cough	50.6	50.1	42.3	41.8	10	27.6	24.3	23.0	20.3	96	2.3	2.4	1.4	1.6
10	R78	Acute bronchitis/bronchiolitis	48.6	48.2	41.8	41.3	6	43.4	41.7	42.0	40.0	5	50.7	44.9	25.5	23.0
11	A97	No disease	48.3	48.6	43.2	43.4	5	44.3	47.3	42.3	44.9	173	0.9	1.0	0.6	0.7
12	S74	Dermatophytosis	47.2	47.9	32.9	33.2	34	9.5	10.0	7.8	8.0	72	3.2	2.9	2.2	2.1
13	H81	Excessive ear wax	43.6	44.7	39.2	40.2	31	11.1	12.3	9.4	10.3	101	2.1	1.8	1.8	1.5
14	R96	Asthma	40.9	40.4	6.7	6.5	8	39.3	35.7	12.1	10.7	62	4.0	3.5	0.7	0.7
15	T93	Lipid metabolism disorder	39.4	41.4	7.5	7.9	14	21.6	28.8	9.1	11.4	17	19.6	14.9	11.1	8.6
16	R97	Hay fever/allergic rhinitis	38.7	39.0	8.8	8.8	11	25.4	23.2	10.0	9.0	209	0.7	0.7	0.4	0.4
17	A04	General weakness/tiredness	37.5	38.0	30.6	30.9	65	4.8	5.4	4.2	4.5	123	1.5	1.2	0.9	0.8
18	P76	Depressive disorder	36.1	36.9	10.1	10.2	15	21.4	25.8	6.7	7.5	31	9.7	7.1	2.4	1.8
19	R75	Sinusitis acute/chronic	35.9	35.9	30.8	30.8	16	20.8	18.8	18.3	16.3	27	10.9	9.9	5.0	4.5
20	A85	Adverse effect medical agent proper dose	35.8	36.9	30.7	31.6	17	20.8	24.0	14.5	17.5	361	0.2	0.2	0.1	0.1
24	T90	Diabetes non-insulin dependent	31.9	33.3	4.1	4.3	19	17.8	28.8	3.1	4.5	11	28.4	19.9	4.6	3.3
25	P01	Feeling anxious/nervous/tense	29.8	30.9	12.7	13.1	26	12.8	14.2	7.5	8.2	20	14.1	10.7	4.4	3.7
27	L86	Back syndrome with radiating pain	24.3	24.9	12.8	13.1	28	12.1	14.7	7.1	8.5	7	43.1	32.0	12.4	9.6
41	D87	Stomach function disorder	18.8	19.4	7.6	7.8	32	10.9	11.3	8.0	7.6	14	21.0	16.9	10.2	8.4
46	K85	Elevated blood pressure	16.4	17.0	8.0	8.2	38	8.1	9.9	5.7	7.2	9	42.3	30.1	8.7	6.8
48	D73	Gastroenteritis presumed infection	15.9	15.5	15.3	14.9	3	80.6	70.7	79.6	69.9	30	10.0	8.7	5.7	5.4
49	R76	Tonsillitis acute	15.5	15.3	14.7	14.5	9	34.4	26.9	32.4	25.4	12	25.6	29.0	13.8	15.5
54	K74	Ischaemic heart disease with angina	15.2	16.0	2.7	2.8	71	4.5	7.9	1.3	1.9	16	19.7	14.0	3.6	2.6
55	R77	Laryngitis/tracheitis acute	15.0	15.1	13.9	14.0	20	17.8	15.6	16.8	14.8	37	7.7	6.2	4.3	3.6
59	K77	Heart failure	14.4	14.9	3.5	3.6	62	5.1	10.4	2.0	3.9	19	14.3	10.2	2.7	2.0
77	L18	Muscle pain	11.1	11.4	7.3	7.4	4	45.0	48.1	40.5	43.2	270	0.4	0.3	0.2	0.2
83	K87	Hypertension complicated	10.3	10.9	0.5	0.5	98	3.3	6.2	0.2	0.3	13	23.2	15.3	4.2	2.7
88	R80	Influenza	9.6	9.6	9.4	9.4	12	25.2	22.8	24.8	22.3	97	2.2	2.0	1.3	1.2
118	P17	Tobacco abuse	7.6	7.7	4.4	4.5	18	19.9	21.3	1.5	1.5	39	7.2	7.3	6.4	6.5
102	P74	Anxiety disorder/anxiety state	8.8	8.9	2.0	2.0	24	14.7	18.3	3.8	4.2	3	60.5	44.3	19.1	14.7
128	L83	Neck syndrome	6.9	7.1	2.4	2.5	74	4.3	4.4	3.4	3.4	8	42.5	30.8	11.8	9.1
162	L84	Back syndrome without radiating pain	5.2	5.4	1.2	1.3	141	2.0	2.8	1.0	1.3	4	52.9	39.7	14.2	11.8
226	D85	Duodenal ulcer	3.4	3.5	0.6	0.6	415	0.2	0.3	0.0	–	10	35.1	26.2	11.2	8.6
267	K80	Cardiac arrhythmia NOS	2.6	2.7	1.0	1.0	479	0.1	0.2	0.0	–	15	20.3	14.6	4.7	3.7
282	R79	Chronic bronchitis	2.4	2.5	0.5	0.5	188	1.3	2.0	0.5	0.7	18	19.3	14.5	4.7	3.5
441	R29	Respiratory symptom/complaint other	0.7	0.7	0.6	0.6	13	24.4	22.2	23.6	21.3	240	0.5	0.5	0.2	0.3
41 ranks		Total Episodes of care (p1000py)	3503.2		2130.1			1731.4		1281.0			1419.1		566.5	
Proportion top 20 EoC of whole distribution			32%					51%					56%			

Nl, Netherlands; Mt, Malta; Sb, Serbia. The 20 most commonly coded EoCs in all three databases are presented. The prevalence rate (rate of that EoC per 1000 patient years and the title representing the diagnosis at the end of an EoC) and incidence rate (rate of that EoC per 1000 patient years and the diagnostic title in this case being that at the start of a new EoC) of the 41 EoC rubrics (presented as a disease label or symptom, i.e. ICPC Components 1 and 7) that describe the 20 most common EoCs in the all three populations are given. Rates are expressed per 1000 patient years of observation, both non-adjusted and adjusted for age and sex to a standardized EU 25 country population. The ranking of each rate in the three respective populations is given (according to their rank in prevalence), and the rubrics are ranked according to the Dutch distribution (ranking in first column). The percentage of all EoCs, which are coded by the top 20 most used rubrics in each distribution is given in the bottom row. 'Rank' gives the rank of that rubric in the distribution of prevalent EoCs in that population. 'Code' gives the ICPC code. 'Label' gives the ICPC-2 text label for that rubric. 'Prevalence' gives the rate of observation of that rubric as an EoC title (both unadjusted and adjusted for age and sex against the EU-25 population). 'Incidence' gives the rate of observation of that rubric as a title of new EoCs (both unadjusted and adjusted for age and sex against the EU-25 population). 'Total Episodes of care (per 1000 py)' gives the total rate of EoC, incident and prevalent, per 1000 patient years. 'Proportion top 20 EoC of total distribution' gives the percentage proportion that these top 20 EoC titles represent, of the total distribution of EoCs.

EoCs for 'disease label' diagnoses (Component 7 rubrics in ICPC) with rather more specifically defined diagnostic criteria, such as anxiety disorder (P74), neck syndrome (L83), back syndrome (L84), duodenal ulcer (D85), cardiac arrhythmia NEC (K80), elevated blood pressure (K85) and chronic bronchitis (R79). This is even more remarkable due to the relatively lower prevalence of other EoCs in the Serb database compared with the other two datasets.

There were many examples with similar incidence or prevalence (adjusted for age and sex), or both, in two or more populations. These include hypertension (K86), acute bronchitis (R78), stomach function disorder (proven by investigation, D87), acute tonsillitis (R76), diabetes (T90), lipid disorder (T93), back syndrome with radiating pain (L86), ischaemic heart disease with angina (K74), heart failure (K77) and complicated hypertension (K87). Anxiety disorder (P74) exhibited rather similar incidence and prevalence in the first two databases but is then more prevalent in the Serb database.

Extended comparison of incidence and prevalence rates

Table 6 is an extended comparison of incidence and prevalence rates, which illustrates the increased accuracy with use of an EoC data model. The prevalence and incidence rates of an extended selection of conditions with strict coding definitions, which may not have been included in a top 20 distributions, and also of mental health, skin, cardiovascular chapters in ICPC are given. These rates are broadly similar between the three populations and in some cases almost precisely so.

Discussion

Summary

First research question. This study describes the content of general practice/FM as characterized by the Transition Project databases, collected from the daily care of selected practice populations in Malta, the Netherlands and Serbia and more specifically as characterized by the distributions of RfEs, interventions and diagnoses within EoCs. Distributions of utilization and incidence and prevalence rates are indicative but do not allow in depth interpretation of the doctor–patient relationship and the content of the consultation.

Second research question. The distributions allow the identification of interesting differences and similarities, due to complex effects which are impossible to disaggregate, including patient needs, burden of disease, socio-economic and demographic realities, culture, health beliefs and the strong effects of different health care systems, besides individual FD approaches, experience and training. Nevertheless, striking similarities were identified in many of the distributions, and the commonalities may be considered to be more striking than the contrasts.

Observed similarities and differences in the distributions of RfEs, interventions and diagnoses, within EoCs in these practice populations provide ample opportunity for reflection in the discussion of these results below. However, notwithstanding such differences, generic similarities in the content and practice of general practice/FM in these practice populations emerge and lend limited support to the existence of an international discipline of FM.

TABLE 6 *Is an extended comparison of incidence and prevalence rates of selected EoCs (episode titles) and ICPC chapters, population by population*

	The Netherlands				Malta				Serbia			
	Incidence		Prevalence		Incidence		Prevalence		Incidence		Prevalence	
Diagnosis	Rate	Standardized	Rate	Standardized	Rate	Standardized	Rate	Standardized	Rate	Standardized	Rate	Standardized
T90—diabetes type II	4.1	4.3	31.9	33.3	3.1	4.5	17.8	28.8	4.6	3.3	28.4	19.9
K86—hypertension	5.3	5.5	75.7	79.2	4.6	6.2	41.1	59.9	19.3	14.4	114.1	79.8
U95—renal stone	2.0	2.1	4.5	4.7	3.4	3.5	5.4	5.9	3.7	3.0	6.7	5.3
D98—cholecystits/lithiasis	2.1	2.1	4.8	5.0	2.0	2.3	3.6	4.5	3.2	2.3	5.3	3.7
S70—herpes zoster	3.9	4.0	5.1	5.2	1.5	1.9	1.7	2.2	1.1	0.8	1.4	1.1
A72—chicken pox	2.4	2.2	2.5	2.3	4.9	3.7	5.4	4.1	0.7	1.3	0.8	1.6
P70—dementia	0.7	0.8	2.8	2.8	0.1	0.2	0.5	1.1	0.2	0.3	0.7	0.6
P72—schizophrenia	0.1	0.1	1.4	1.4	0.0	–	0.5	0.7	0.3	0.3	2.6	2.8
All Chapter P Component 7	21.0	21.3	69.6	70.7	12.2	13.5	42.5	51.5	23.3	18.3	81.0	61.5
All Chapter P	80.5	81.4	206.4	210.5	31.0	34.0	95.6	110.6	38.7	32.2	113.3	88.0
All Chapter S	320.1	319.8	457.4	459.3	110.2	109.6	132.4	132.5	45.3	40.4	72.1	61.3
All Chapter K	76.7	79.1	275.2	286.2	35.9	48.5	104.4	153.5	66.4	49.4	294.4	208.1

Rates are given per 1000 patient years, both unstandardized and also adjusted for age and sex to the EU25 population (2005). Rates for diabetes (Dutch data include type I), hypertension, nephrolithiasis, cholecystitis, herpes zoster, varicella, dementia, schizophrenia, all mental health (ICPC Chapter P labels), skin (Chapter S) cardiovascular (Chapter K) and 'disease label' mental health (Chapter P, Component 7) problems are given.

Third research question. Being subject to myriad effects, which cannot be separated, the observed similarities in these distributions lend only modest support to the hypothesis of an international academic discipline of FM. Further analysis to shed additional light should include a study of the process of diagnosis in FM, and this is performed in a companion article in this series.[25]

Population

The over-representation of male children and young women in the Maltese and (less so) Dutch practice populations (Fig. 1) is a typical effect of a relative tendency of higher patient contact rates in these groups. The sad effects of war on the Serb population are evident from the distribution, besides the effect of FDs not being 'allowed' to care for children <15 years.

Coding

The pattern of ICPC utilization (Table 3) indicates that Dutch FDs use ICPC in a more comprehensive way, but this comparison is rather limited by the fact that the Serb database covers only 1 year of observation. There is more consistency across populations in coding RfEs, when compared to EoCs, even though both are coded with the same range of ICPC rubrics.

Utilization

Generally speaking, there are larger differences in the distributions of utilization than in the distributions of RfEs and EoCs. For example, the Maltese data (Table 2) indicate relatively fewer contacts per patient year, and this may indicate a relative lack of continuity of care in Malta due to the absence of a patient registration system. In fact, a larger proportion of EoCs in the Maltese database contain only one encounter compared with the other two databases (data not tabulated). This is also a reflection of a tendency for filling out repeat prescriptions for free in Maltese Government dispensaries rather than with the private FD against additional payment. The Serb data tend to show more problems managed per encounter (subencounters, or diagnoses, per encounter) but relatively fewer new problems (EoC) per patient year. The Serb FDs thus seem to focus on the care for chronic, rather than new, health problems. The Dutch data, with more data per contact and per EoC, probably represent a good example of complete data recording in a patient population, which goes to their FD for most of their care.

Interventions

The Dutch FDs seem to perform more interventions per patient year (Table 2), but the variability of intervention rates per EoC across populations is less, indicating that much of the variability is explained by Dutch FDs seeing more problems per patient year. This pattern is the same for prescriptions (Serb data are unavailable).

Reasons for encounter

The distributions of incident and prevalent RfEs in the three populations (Table 4) also exhibit similarities and differences. The differences observed may be plausibly explained by various interacting effects, as outlined in the 'Summary' section above. For example, the cultural approach to tiredness as a medical complaint in the Netherlands,[26] the requirement for sickness certificates from a doctor from the first day of illness in Malta[16] and the effects of post-traumatic stress and of demographic change due to war in Serbia may all be linked to differences in the observed incidence and prevalence of the respective RfEs. Serb FDs had to refer any gynaecological problems and all children.

However, many striking similarities in incidence or prevalence rates, or both, are evident between two or three of these populations, even when adjusted for age and sex. Examples include cough (R05), abdominal pain (D01), earache (H01), headache (N01), chest complaints (L04), urinary symptoms (U01 and U02) and red eye (F02). Another striking similarity is that the common top 20 distributions in these three populations are described using only 36 ICPC rubrics, and these 20 rubrics describe the majority (66%, 64% and 83%, respectively) of the total number of RfEs presented to the FDs. In general, there is indeed remarkable overlap in the distribution of RfEs in these three populations.

Episode titles

In the distribution of EoCs, listed by their episode label (Table 5), the prevalence and incidence rates of the selected top 20 (prevalent) EoC rubrics exhibit similarities and differences, as seen with the distributions of RfEs.

In fact, there is a distinct trend for relatively higher incidence and prevalence of various EoCs in the Maltese and Dutch databases, in correspondence with a complementary phenomenon (Table 4) with respect to higher prevalence of the symptoms and complaints (RfEs) associated with these diagnoses. This evidently reflects an effect of FDs addressing patient needs, expressed as RfEs.

Independent of this phenomenon, the incidence and prevalence of many other EoCs were remarkably similar, especially with respect to 'disease label' ICPC Component 7 diagnoses (as against 'symptom label' Component 1 diagnoses).

Similarities and differences

As explained above, the observed differences may be due to various effects, including FD attitudes to coding (e.g. Serb doctors seem to record fewer new EoCs in general), patient requests (e.g. higher incidence and prevalence of RfEs associated with respiratory and

acute viral illness in Malta were also reflected in the respective EoCs such as R74) and system effects (e.g. disease-specific health promotion or prevention programmes or guidelines, different systems for repeat prescriptions, the fact that the Serb primary care system was a new and possibly relatively weaker system, etc.) but also hard epidemiological differences, such as the Dutch FDs being involved with many more EoCs for family planning, practically non-existent in Malta and Serbia due to cultural and religious reasons.

Serb FDs were less involved in prevention (A98) and administrative paperwork (part of A97), possibly reflecting the involvement of practice nurses in these activities, and a tendency for the latter not to code all that was done in the practice. There appeared to be a preference of Serb FDs for disease label diagnoses over symptom diagnoses, in contrast to their Dutch and Maltese colleagues. This may be a vestige of their antecedent experience with using International Classification of Diseases (ICD) version-10 (which makes coding a symptom diagnosis much more difficult) exclusively in a hospital setting until this pilot project started. The high prevalence of P74 (anxiety disorder) in the Serb database is expected due to the recent effects of war, but the low prevalence of P76 (depression) is remarkable in contrast.

The incidence and prevalence rates of a number of disease label diagnoses with strict coding criteria were remarkably similar between the three databases. The prevalence of hypertension, for example (Table 5), was very similar in the three databases, but slightly lower in Malta, where there may be an effect of the loss of continuity of care with repeat prescriptions being issued at Government clinics. However, these rates still compare far better between them than equivalent data from population-based epidemiological studies of the prevalence of hypertension in Europe and the rest of the world.[27]

Validation through extended comparison of incidence and prevalence rates

This latter point is further explored in the extended comparison of incidence and prevalence rates of selected EoCs (episode titles) and International Classification of Diseases (ICD) version chapters (Table 6). Many of these rates are strikingly similar; for example, renal stone and cholecsytitis/lithiasis rates were more consistent between the three datasets than those for herpes zoster, which is often quoted as a useful standard comparator rate to check for denominator problems in EMR databases.

The standardized prevalence of diabetes was also quite similar in all three databases, although it might be expected to be higher in Malta compared with the Netherlands. However, in another study based on the same Transition Project data, the standardized incidence and prevalence of diabetes (calculated using the number of people consulting per year as the denominator and standardized to the Maltese population to estimate a population, and not practice population, prevalence) were almost identical to those derived from a population-based epidemiological study of diabetes in Malta by Schranz in the 1980s.[17,28]

The rates for skin and cardiovascular conditions vary between databases, possibly reflecting real population differences as well as health care system priorities for prevention activity. The low rate for cardiovascular disease (Chapter K of ICPC) measured in the Mediterranean island Malta is understandable but may also partly reflect failure of continuity of care (see above). In contrast, the low rate of skin conditions (chapter S) in Serbia seems to be due to readily accessible self-referrals to secondary care specialists working in the same community health centres with the FDs.

The trend for rates of disease label diagnoses to be generally similar was also evident in the mental health chapter of ICPC (Chapter P). In contrast, the rates for all mental health chapter EoCs including symptom diagnoses (Components 1 and 7 together) are strikingly different. This divergence is therefore due to differences in the rates for symptom diagnoses. An example of this could be a diagnosis of sadness (P03), or anxiety (P01), due to the symptom not fulfilling *Diagnostic Statistical Manual of Mental Disorders* (version 4, DSM-IV) criteria to allow a diagnosis of depression (P76) of anxiety neurosis (P74) to be made. It seems that such a practice is more prevalent in the Netherlands, and this inflates the prevalence of 'all mental health problems' (ICPC Chapter P) due to inclusion of milder conditions with a symptom diagnosis.

The similarities in the extended comparisons in Table 6 support the accuracy of our EoC data model and increase our confidence in our findings.

Comparison with existing literature

The literature on international comparisons of EMR data collected from FM is limited, notwithstanding the long tradition of such studies in the UK and the Netherlands. The trend is for data to be aggregated from FD practices treated as a population sample, with the aim to enhance generalizability of derived statistics to the general population and consequently inform public health policy. FD practices are consequently selected with a focus on generalizability and representativeness, and inter-practice variation is considered to be a bias rather than a real phenomenon to be studied. The direct applicability of such data to day-to-day FD care is limited, due to the emphasis on population prevalence of specific diseases rather than data, which can be applied clinically. Additionally, precious few international comparisons of these databases have been published.

One notable exception was the electronic health indicator data (eHID) project, which compared incidence and prevalence data of indicator diseases collected from FM EMR databases in eight European countries,

including the Transition Project data from Malta.[17] The rates for the incidence and prevalence of diabetes and ischaemic heart disease were quite comparable (e.g. the prevalence of diabetes was estimated to range between 22.3 and 64.6 per 1000, with Malta and Italy having comparable rates at the top of the range). However, the data for mental illness prevalence were strikingly different, ranging from 18 to 200 per 1000 from Belgium to France. This anomaly was due to a weakness of the data collected, due to the different classifications used in different countries, along with an inability to capture episode typing of data. The Component 7 mental health chapter rates we report (Table 6) are much more consistent and illustrate how the use of ICPC and an EoC data model would have allowed a much more accurate picture to be obtained in the eHID project.[17]

The study by Okkes *et al.* using ICPC from three countries, and data collected using ICD-9 from the USA, also found important differences and striking similarities between databases. Differences in the numbers of EoC and of encounters per patient per year were small compared with differences in utilization per EoC, including diagnostic and therapeutic interventions. Similarities between the databases were much better reflected by the way patients formulate their demands for care (RfEs) rather than the diagnoses made by the FD.[9] These findings are very similar to those we report here.

Boerma[10] reports on differences in rates of utilization and process between family practice populations in different European countries. He comes to the conclusion (p. 164) that most of the variation in such rates could be explained by the effects related to the health care system rather than due to the effects of doctors and practices (practice populations). We also observed larger differences between utilization and process rates as against distributions of EoCs, and even less so for distributions of RfEs. We thus agree with the conclusion of Boerma that the influence of the health care system on the 'task profile' of FM seems to have a larger effect on utilization as against distributions of EoCs and patient needs for care. This has an implication of the internationality of FM—health care system differences seem to affect what doctors do but have less effect on what patients request or on which EoCs actually happen. As such, the effects of health care system differences are related more to FD activity and related less to the core aspects of the practice of the discipline of FM. This phenomenon is also reflected in the commonalities we found between the processes of diagnosis in different populations in a related study in the series.[25]

Generalizability

The generalizability of data collected from a group of practices may theoretically be improved by adjusting mean effect estimations for variation across clusters, to correct for inter-doctor and inter-practice variation. This is an appropriate approach when one conceptualizes such practice populations as unbiased cluster samples of a larger population under study, such as in public health studies. In such a case, inter-doctor variation may be considered to be an undesirable feature of the data.

However, this study conceptualizes the practice of FM as a complex adaptive system, based on a caring relationship between an FD, or group of FDs, and a population of patients that tends to be stable over time. In this case, the effect of the individual doctor is a core element of the data thus collected, and the effect is not considered at all as a bias.

Adopting this latter model has at least two major implications. One is that the analysis of a component of the system in isolation has limited generalizability to the whole, due to the non-linear properties of complex systems (often called the 'butterfly effect'), and this limitation cannot be overcome through statistical methods, which simply widen the confidence interval of an observation.[29] Secondly, components of the variation of observed rates between populations are also complex, being composed of multiple interacting effects as explained above (e.g. age, sex, geographical location, culture, socio-economic status, co-morbidity, inter-doctor variation, changing evidence base over time, etc.).

FDs are often selected to participate in EMR research after they have accepted to record such data carefully, and in depth, over time. Therefore, these FDs are often not representative of FDs in a national system, but rather tend to collect data at a higher level of detail and accuracy than their colleagues, and may have an incentive to do so, be it financial or academic. Thus, the analysis of such data exhibits many of the qualities and limitations of both qualitative and quantitative research methodologies, sacrificing some generalizability for depth and accepting inherent features, which cannot be adjusted for mathematically without introducing new systematic errors and biases.

Studies of EMR data are complementary to epidemiological surveys and are not necessarily less valid or less generalizable. A recent study by Esteban-Vasallo *et al.* comparing observations based on EMR data from FDs within a national epidemiological survey concluded that both perspectives are different but complementary. One is not inherently superior to the other, at least with respect to estimating the prevalence of chronic diseases.[30] A similar conclusion was recently reported by Barber *et al.*,[31] who found that epidemiological surveys based on self-reports are not necessarily better than FM EMR studies of prevalence rates, especially for less well-defined diagnoses.

Limitations

The three databases were selected since these data were available, current and contained data on both RfEs and

diagnoses within an EoC structure. These data were collected for research purposes from selected practices, with the exception of Serbia, and may not necessarily be generalizable to the populations of these three countries as a whole. A comparison of data from more countries, had they been available, would have allowed a more powerful international comparison. One key message from this study is that more data are needed for such comparisons, and this research should be extended to other countries.

The Serb FDs were recruited fresh out of a hospital environment into a foreign ICRC programme, chosen to join a fledgling primary care system and use innovative information technology and a new classification. Their motivation may have been very different to the other FDs in this research project. The quality of data recording may suffer when it is collected by larger numbers of less motivated doctors. This may have been the case in Serbia, where doctors did not volunteer. However, these data afforded perspectives on a system with complete coverage of a whole municipality in the South of the country. The Serb rate of RfEs per new EoC is less than unity, indicating that some new EoCs were recorded without any RfE at all, reflecting a failure of software error trapping.

Some of the Dutch Transition Project FDs were remunerated to participate in the project, but many continue to record data even though the funding had formally stopped. The Maltese FDs volunteered to join the project and had to pay to support development of the software to their particular needs. The practice population in Malta represents a population of patients consulting over a 5-year period with private FDs. Most patients in a practice will consult at least once in such a time frame. Most Maltese have a relationship with one private FD, but a minority of patients use the government health centres as their main provider, and we had no access to data from these clinics.

An additional source of differences is represented by the fact that the Dutch database contains more repeat prescriptions. The incidence and prevalence rates for some EoCs (for example A98, W11, P06, data not tabulated) could have been different should the data have been analysed separately by type of encounter (say, excluding repeat prescriptions). However, this would only partly explain the observed differences since the Dutch rates for many EoCs during face-to-face encounters would still have been considerably higher than the Maltese, and especially the Serb, rates. For example, family planning with oral contraceptives is indeed far more common in the Netherlands, independent of the effect of repeat prescriptions. Analysing data by different types of encounter (say, excluding repeat prescriptions) would also reduce the power of the database, and amplify differences due to system effects (such as different procedures for obtaining repeat prescriptions between systems), and different preferences for a home visit for certain conditions in different practices.

This was a study of EoCs, and not episodes of illness, in the community. Should the distribution of episodes of illness be similar between these three countries, nevertheless the distributions of EoCs might be very different. For example, the prevalence of EoCs for otitis media in the Netherlands is declining as patients come to understand that they are less likely to get an antibiotic from their FD, due to current treatment guidelines. Patients are therefore less likely to attend for this condition, even though the illness may be as prevalent as in the past. In this case, the prevalence of EoCs is decreasing due to a health care system effect, independently of actual disease prevalence. Rather than a limitation, however, this is actually a different perspective of a complex reality.

Strengths

The fact that the EMR TransHis guides and supports the doctor during coding, providing ICPC coding criteria and software error trapping, improves the quality of the data collected, which in turn improves its reliability.

The software and classification system provide data, which allow the calculation of precise incidence and prevalence rates of both EoCs and RfEs in these primary care populations from these three countries. The use of an EoC model corrects for diverse artefacts of observation, including the effect of multiple consultations for the same problem, and this allows the correct interpretation of multiple incident episodes in one individual in a defined period of observation. This has been validated using the data in Table 6.

Other artefacts, such as the paradoxical increase in incidence in the very old (>85 years of age) due to high mortality rates, are adjusted for by the accurate patient–year denominator in this project.

These qualities of these databases are a substantial strength, which supports the conclusions of this study.

Conclusions

In this study, we describe differences in the distributions of utilization, RfEs and EoCs in the Transition Project patient populations. These reflect cultural, socio-economic, religious, spiritual and health care system effects, beside inter-doctor variation in care processes and attitudes to care, and actual population differences in the incidence and prevalence of diseases or health problems. We could not tease out individual effects. However, we found modest evidence of both an international and a local FM content, reflected by important similarities in these distributions, at least with respect to overlap in the actual content of FM

practice reflected in distributions of RfEs and EoCs, less so in distributions of utilization.

Data which are not collected within an episode-based model are less able to characterize incidence and prevalence rates since the rates are not corrected for the effect of multiple encounters for one health problem. Incidence and prevalence, two classical epidemiological indicators, allow exploration of the similarities and differences between different FM populations, but they do not reflect the content of the doctor-patient encounter beyond a superficial perspective.

FM is a complex discipline, and the reduction of the content of a consultation into one or more medical diagnoses, ignoring the patient's RfE, is a coarse reduction, which lacks power to fully characterize a population's health care needs. In fact, RfE distributions seem to be more consistent between populations than distributions of EoCs are, in many respects.

Acknowledgements

Author contributions: JKS developed the research methodology, collected data (from Malta), analysed data and was the lead writer of the manuscript; IO developed the research methodology, analysed data and participated in writing the manuscript; SO developed the research methodology and analysed data; KvB developed the research methodology and collected data; PZ collected data; MJ collected data; FD developed the research methodology and participated in writing the manuscript and HL developed the research methodology, collected data, analysed data and participated in writing the manuscript until his death in late 2008. The authors would like to thank the associate editor, Prof. Martin Dawes, and the two reviewers who helped improve this paper with their detailed review and feedback. This study would not have been possible without the participation of the Transition Project doctors. From the Netherlands: C van Boven, MD, PhD, Franeker; P H Dijksterhuis, MD, PhD, Wirdum and Olst; A Groen, MD, Amstelveen; J de Haan, MD, Franeker; A M Honselaar-De Groot, MD, Amstelveen; D Janssen, MD, Franeker; T A L Polman, MD, Franeker; G O Polderman, MD, Amstelveen; K E I Stolp, MD, Amstelveen; N Valken, MD, Wirdum; M T M Veltman, MD, PhD (deceased), Amstelveen; M Woerdeman, MD, Amstelveen. From Malta: Francis Paul Calleja, MD, Birkirkara; Carmen Sammut, MD, Siggiewi; Mario R Sammut, MD, MSc, Siggiewi; Daniel Sammut, MD, Zabbar; David Sammut, MD, Zabbar; Jason Bonnici, MD, Zabbar; John Buhagiar, MD, Zabbar; Andrew Baldacchino, MD, Zabbar. From Serbia: the FDs in the region of Kraljevo, part of the ICRC project.

Declaration

Funding: The European Union Financial Protocol 7 project 'TRANSFoRm' (FP7 247787, www.transformproject.eu) supported part of the protected time of the authors in performing this study, through its partner the Mediterranean Institute of Primary Care (www.mipc.org.mt).
Ethical approval: The study did not involve the collection of new data. Ethical approval was applied for locally, when appropriate, for individual studies based on these data in the Netherlands, Serbia and Malta.
Conflict of interest: none.

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