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Cardiovascular disease and musculoskeletal disorder labels in family practice acted as markers of physical health severity

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Abstract

Objective: Family practitioner diagnostic labels applied in consultation provide a signpost for treatment and management. Yet, it is unknown whether each label reflects the health of the respective patient group.

Study Design and Setting: Consultation records of 7,799 patients aged 50 years and older from six family practices were linked to a cross-sectional baseline health survey. Associations between six mutually exclusive cardiovascular disease and nine mutually exclusive musculoskeletal disorder categories, and physical health severity as measured by the Short Form-12 questionnaire were examined.

Results: There were 2,447 (31.4%) cardiovascular disease and 3,321 (42.6%) musculoskeletal disorder consulters. The mean physical health scores ranged from 38.38 (95% confidence interval [CI]: 37.8−39.0) for *hypertension* to the poorest score of health 28.98 (95% CI: 27.5−30.5) for consulters with *heart failure*, whereas in the musculoskeletal disorder group, scores ranged from 44.85 (95% CI: 42.2−47.5) for *soft tissue disorder* to 28.79 (95% CI: 26.8−30.8) for consulters with *inflammatory polyarthropathy* (trend $P < 0.001$). This trend in the association between diagnostic categories and physical health severity within both spectrums remained after adjustment for confounders.

Conclusion: Specific diagnostic labels for selected chronic illness indicate the severity of physical health for the corresponding consulting population.

Keywords: Cardiovascular diseases; MSK diseases; Diagnosis; Quality of life; Epidemiological studies

1. Introduction

A visit to family practice is marked by the application of a label summarizing the main presenting complaint. This label, usually attributed by the family practitioner (FP), determines the course of health care management or treatment [1]. For example, routine chronic disease clinics that monitor individual patients with conditions, such as diabetes [2] and ischemic heart disease [3], have their respective labels that provide key signposts for the health care management pathway of the patient [4].

The presenting complaint of the patient can fall within a wide spectrum of health, including nonspecific and self-limiting symptoms such as pain or infections or specific disorders such as anxiety or depression. Complaints can also relate to specific chronic conditions, including a number of potentially interlinking *diseases* affecting the same system (e.g., cardiovascular), a series of unrelated *disorders* (musculoskeletal), or spectrums which can include both disease and disorder.

The variation in the use of labels [5] can be dependent on both patient-related [6] and clinician-related [7] factors. Patients may present at different points as a result of changes in their health and clinical histories that may be specific or complex. Clinician choices can relate to (1) integration of complex information from a variety of sources, (2) imperfect or incomplete information, (3) the presence of uncertainty, and (4) complex interactions between the clinician and the patient [8]. In the end, the final choice of label at one time point could therefore relate to any stage along a disease or disorder spectrum (between onset and end stage). These labels in themselves will be either a ''working diagnosis'' (e.g., symptom-related only) or a definitive ''diagnostic label'' based on a combination of clinical assessment and further information, such as investigation. However, whether the choice of this label within the same

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What is new?

Key finding
Diagnostic labels applied in family practice can indicate the severity of physical health within categories of cardiovascular disease and musculoskeletal disorder.

What this adds to what was known?
Although diagnostic variability has been shown to exist in family practice, our results support the concept that groups of consulters with the same diagnostic label as recorded in clinical encounters could be grouped into exclusive measures of severity.

What is the implication, what should change now?
Our findings show the usefulness of routinely collected morbidity data as implicit indicators of severity. This method shows the potential for epidemiological construction of populations using morbidity data, the clinical implication supporting the potential for testing this method in clinical decision-making research.

spectrum of ''diagnostic'' possibilities reflects the severity as measured by health is unknown.

Chronic disease or disorder spectrums may comprise symptoms and pathologies that are related or unrelated to each other [9]. For example, in musculoskeletal disorders, diagnostic labels can range from pain symptoms that are regional [10] or widespread [11] to pathology that is localized such as osteoarthritis [12] or to more systemic conditions such as rheumatoid arthritis [13]. Notably the pain symptoms could either be self-limiting [14] or be part of an established chronic disease such as osteoarthritis [15]. In contrast, within cardiovascular diseases, current evidence has more clearly focused on a linked pathway in relation to development of this disease spectrum [16,17]. Therefore, hypertension may be a preceding risk factor to myocardial infarction, which in turn can progress to end-stage heart failure in some individuals [18]. Yet, even within this spectrum, it is not clear as to how the stages of disease development can affect the patient population and whether this reflects the associated severity of general health [19].

From this current perspective of clinical encounters in family practice, we have taken two examples of chronic illness spectrums to identify two distinct questions: (1) do different labels that form the stages of a *disease* spectrum, that is, cardiovascular disease, reflect the associated health severity of the corresponding patient group, and (2) do different labels that form the stages of a *disorder* spectrum, that is, musculoskeletal disorder, also reflect the associated health severity of the corresponding patient group.

2. Methods

2.1. Design

Using a consultation-survey linkage data set from six family practices, the study hypotheses were investigated in the population aged 50 years and older. These participants had completed a cross-sectional survey that was subsequently linked with consent to their clinical records for the 2 years before the baseline survey. The study was given local research ethics committee approval.

2.2. Study population

The study practices are part of the North Staffordshire General Practice Research Network, and the practices routinely use the Read classification [20] to code clinical encounters with their patients. The registered practice populations aged 50 years and older had taken part in a larger general population survey [21], which included a subsurvey focusing on joint pain symptoms in the population. The larger survey was sent to 20,293 people and 13,986 (68.9%) responded, with nonresponders showing similar characteristics to previous surveys [22]. From these responders, 10,432 consented to the review of their computerized clinical records, and of these consenters, 8,962 people had had a morbidity consultation in the 2 years before the baseline survey. However, only 7,779 had completed the Short Form (SF) questionnaire, and it was this group that formed the study sample, and their survey data were linked to the morbidity data coded by FPs as the patients had presented their problems during consultation.

2.3. Baseline survey measures

In the baseline health questionnaire survey, the physical component summary (PCS) score of the SF-12 provided the primary outcome measure of physical health severity [23]. The SF-12 also provides the mental component summary (MCS) score, which was used as a measure of psychological health. Other survey data included were age, gender, and Index of Multiple Deprivation (IMD) based on the 2004 census as an area-level measure of deprivation [24]. An IMD score combines a number of indicators, including economic, social, and housing issues, into a single deprivation score for each small area in England.

2.4. Selection of cardiovascular diseases and musculoskeletal disorders

In clinical consultations, FPs had used the Read classification to code the morbidity as presented by patients. Read classifications have a main chapter heading, for example, Chapter G for cardiovascular disease and Chapter N for musculoskeletal disorders. Within each chapter, there are four sublevels of coding, and we used the third hierarchical level to define diagnostic categories for the study. For the cardiovascular disease and musculoskeletal disorder

spectrums, we selected diagnostic labels based on an *a priori* order of hypothesized severity, with these labels being selected on the basis of a clinically validated severity classification [25] and clinical judgment of an experienced FP (U.T.K.). All patients who had consulted for any cardiovascular disease or musculoskeletal disorder in the 2 years before baseline survey were identified from the study sample. Within these consulters, we categorized individuals into exclusive diagnostic categories, and these were ordered by *a priori* severity ranging from ''least severe'' to ''most severe.'' The six exclusive cardiovascular ''disease'' categories selected were (1) *hypertension* (least severe), (2) *atrial fibrillation*, (3) *ischemic heart disease*, (4) *angina*, (5) *myocardial infarction*, and (6) *heart failure* (most severe). The nine exclusive musculoskeletal ''disorder'' categories were (1) *soft tissue disorder* (least severe), (2) *soft tissue pain*, (3) *peripheral enthesopathies*, (4) *joint disorders*, (5) *back pain*, (6) *neck pain* (7) *osteoarthritis*, (8) *osteoporosis*, and (9) *inflammatory polyarthropathy* (most severe). The exclusiveness of severity categories means that allocation of an individual to one of these was based on the most severe category; for example, if an individual had consulted for hypertension and heart failure, they would be classified into the heart failure category.

The remaining patients from the study sample formed a comparator group, who were people who had not consulted for one of the study-specific Read codes (cardiovascular or musculoskeletal), and they represent the wider consulting sample.

2.5. Statistical analysis

For the main outcome measure, we used the dichotomized mean PCS score (39.80, standard deviation [SD]: 12.5) for the study sample to investigate our primary hypotheses. Within both study groups, the results for each of the exclusive diagnostic categories were summarized by age, gender, deprivation and psychological status (also dichotomized using the mean score: 48.59, SD: 11.4), and morbidity counts. Morbidity counts categorized individuals in the 2-year period of observation into consulters for (1) one morbidity only, (2) two to four morbidities, (3) five to eight morbidities, (4) 9–13 morbidities, and (5) 14 or more morbidities. These counts refer to at least one consultation for any given morbidity and do not include repeat consultations for the same morbidity. Age was categorized into four groups: 50–59, 60–69, 70–79, and 80 years and older, and IMD deprivation status was categorized into quartiles from category 1 (affluent) to category 4 (deprived). The mean PCS score (with 95% confidence intervals [CIs]) for each diagnostic category within the two spectrums is presented graphically. Associations between diagnostic categories and physical health were estimated as odds ratios (with 95% CIs) using logistic regression methods. Associations were adjusted separately for (1) age, gender, and deprivation status; (2) age, gender, and deprivation and psychological status; and (3) all factors and morbidity counts. A statistical trend in the estimates within the ordered spectrums was assessed using the null hypothesis in relation to a linear trend. Statistical significance in analyses was defined as $P < 0.05$, all hypothesis testing was two tailed, and analyses were performed using SPSS version 15.0 (SPSS Inc, Chicago, IL).

3. Results

In the study population of 7,799, there were 2,447 (31.4%) patients who had consulted for one of the specified cardiovascular diseases and 3,321 (42.6%) patients who had consulted for one of the specified musculoskeletal disorders, with 1,037 (13.3%) of these having consulted for both chronic problems. There were 3,068 (39.3%) people with a mean PCS score of 43.73 (SD: 12.0) who had not consulted for any one of the cardiovascular or musculoskeletal diagnostic categories.

3.1. Characteristics of cardiovascular disease group

Of the 2,447 cardiovascular disease consulters (Table 1), just less than half were men or aged 70 years and older. This group had a higher proportion with those who were deprived or had a good psychological status, with 42% consulting for 14 or more morbidities in the 2-year time period.

There were 1,606 (65.6%) exclusive consulters with *hypertension*, 115 (4.7%) with *atrial fibrillation*, and 139 (5.7%) with *heart failure*. The lowest numbers were observed for *myocardial infarction* (44 [1.8%]). There were more women than men in the *hypertension* and *atrial fibrillation* groups, but the situation was reversed for the other diagnostic categories. There were no clear differences between the groups in relation to deprivation status, but the *heart failure* group had the poorer psychological status and two-thirds of these had consulted for 14 morbidities or more. The highest proportion (41%) of those aged 80 years and older was also in the *heart failure* group.

3.2. Characteristics of musculoskeletal disorder group

Of the 3,321 patients with a musculoskeletal disorder (Table 2), more than half were women aged 69 years or younger. There was no difference in deprivation and most had a good psychological status, with 34% consulting for 14 or more morbidities in the 2-year time period.

The highest number of exclusive consulters was 850 (25.6%) for *osteoarthritis*, followed by 650 (19.6%) with *back pain*, and then 556 (16.7%) with *soft tissue pain*. Only 102 (3%) patients had consulted for an *inflammatory polyarthropathy*. With the exception of *peripheral enthesopathies*, women were more likely to have consulted for any of the other musculoskeletal categories than men. There were no distinct differences in relation to deprivation status,

Table 1
Characteristics of cardiovascular disease group

Study factor	Hypertension (*n*=1,606) *n* (%)	Atrial fibrillation (*n*=115) *n* (%)	Ischemic heart disease (*n*=257) *n* (%)	Angina (*n*=286) *n* (%)	Myocardial infarction (*n*=44) *n* (%)	Heart failure (*n*=139) *n* (%)	Total (*n*=2,447) *n* (%)	Comparator group (*n*=3,068) *n* (%)
Age group (yr)								
50−59	353 (22.0)	11 (9.6)	38 (14.8)	44 (15.4)	11 (25.0)	5 (3.6)	462 (18.9)	1,250 (40.7)
60−69	546 (34.0)	34 (29.6)	91 (35.4)	91 (31.8)	9 (20.5)	26 (18.7)	797 (32.6)	918 (29.9)
70−79	507 (31.6)	44 (38.3)	99 (38.5)	104 (36.4)	18 (40.9)	51 (36.7)	823 (33.6)	646 (21.1)
80+	200 (12.5)	26 (22.6)	29 (11.3)	47 (16.4)	6 (13.6)	57 (41.0)	365 (14.9)	254 (8.3)
Gender								
Male	669 (41.7)	51 (44.3)	170 (66.1)	152 (53.1)	36 (81.8)	72 (51.8)	1,150 (47.0)	1,462 (47.7)
Female	937 (58.3)	64 (55.7)	87 (33.9)	134 (46.9)	8 (18.2)	67 (48.2)	1,297 (53.0)	1,606 (52.3)
Deprivation status, categories								
1 (affluent)	345 (21.5)	27 (23.5)	51 (19.8)	49 (17.1)	15 (34.1)	35 (25.2)	522 (21.3)	840 (27.3)
2	321 (20.0)	24 (20.9)	59 (23.0)	54 (18.9)	14 (31.8)	41 (29.5)	513 (21.0)	842 (27.5)
3	406 (25.3)	39 (33.9)	65 (25.3)	100 (35.0)	6 (13.6)	33 (23.7)	649 (26.5)	714 (23.3)
4 (deprived)	533 (33.2)	25 (21.7)	82 (31.9)	83 (29.0)	9 (20.5)	30 (21.6)	762 (31.1)	671 (21.9)
Psychological status								
Good	939 (58.5)	59 (51.8)	135 (52.5)	125 (43.7)	23 (52.3)	54 (38.8)	1,335 (54.6)	1,933 (63.0)
Poor	667 (41.5)	55 (48.2)	122 (47.5)	161 (56.3)	21 (47.7)	85 (61.2)	1,111 (45.4)	1,134 (37.0)
Morbidity count								
1	17 (1.1)	2 (1.7)	4 (1.6)	1 (0.3)	0 (0)	1 (0.7)	25 (1.0)	607 (19.8)
2−4	182 (11.3)	16 (13.9)	37 (14.4)	23 (8.0)	5 (11.4)	6 (4.3)	269 (11.0)	1,181 (38.5)
5−8	371 (23.1)	18 (15.7)	59 (23.0)	54 (18.9)	7 (15.9)	15 (10.8)	524 (21.4)	718 (23.4)
9−13	404 (25.2)	23 (20.0)	69 (26.8)	73 (25.5)	8 (18.2)	24 (17.3)	601 (24.6)	329 (10.7)
⩾14	632 (39.4)	56 (48.7)	88 (34.2)	135 (47.2)	24 (54.5)	93 (66.9)	1,028 (42.0)	233 (7.6)

Read code classifications used by family practitioners: G20 = hypertension; G57 = atrial fibrillation; G3 = ischemic heart disease; G33 = angina; G30 = myocardial infarction; G58 = heart failure. The ‘‘comparator group’’ represents those without a study-specific (cardiovascular or musculoskeletal) Read code.

but consulters were more likely to report poor psychological status for *neck pain*, *osteoporosis*, and *inflammatory polyarthropathy* categories. More than 40% of consulters with *neck pain*, *osteoarthritis*, *osteoporosis*, or *inflammatory polyarthropathy* categories had the highest morbidity count of 14 or more.

3.3. Associations between cardiovascular categories and physical health

The mean PCS scores with 95% CIs for this group are shown in Fig. 1. Mean PCS scores decreased across the hypothesized severity spectrum, ranging from 38.38 (95% CI: 37.8−39.0) for *hypertension* to the lowest score of 28.98 (95% CI: 27.5−30.5) for consulters with *heart failure* (trend $P < 0.001$). The estimated odds ratios were as follows (unadjusted vs. adjusted for age, gender, deprivation and psychological status, and morbidity count): *atrial fibrillation* (1.8 vs. 1.5), *ischemic heart disease* (2.6 vs. 3.0), *angina* (3.6 vs. 3.2), *myocardial infarction* (2.5 vs. 2.8), and *heart failure* (6.1 vs. 3.5). These estimates diminished when fully adjusted with morbidity counts (Table 3), but the trend in the association between the ordered diagnostic categories and poorer physical health remained significant ($P < 0.001$).

3.4. Associations between musculoskeletal categories and physical health

The mean PCS scores with 95% CIs for this group are shown in Fig. 2. Mean PCS scores decreased across the hypothesized severity spectrum and ranged from 44.85 (95% CI: 42.2−47.5) for *soft tissue disorder* to 28.79 (95% CI: 26.8−30.8) for consulters with i*nflammatory polyarthropathy* (trend $P < 0.001$). The estimated odds ratios were as follows (unadjusted vs. adjusted for age, gender, deprivation and psychological status, and morbidity count): *soft tissue pain* (2.8 vs. 2.6), *peripheral enthesopathies* (1.6 vs. 1.8), *joint disorder* (2.7 vs. 2.7), *back pain* (3.0 vs. 3.0), *neck pain* (4.4 vs. 3.8), *osteoarthritis* (6.6 vs. 5.4), *osteoporosis* (7.2 vs. 5.3), and *inflammatory polyarthropathy* (14.2 vs. 9.8). These estimates diminished with full adjustment with morbidity counts (Table 3), but the trend in the association between the ordered diagnostic categories and poorer physical health remained significant ($P < 0.001$).

3.5. Comparison of the two chronic illness spectrums

The overall mean PCS score for the cardiovascular disease group was 36.3 (SD: 12.0), and the score for the

Table 2
Characteristics of musculoskeletal disorder group

Study factor	Soft tissue disorder (n=62)	Soft tissue pain (n=556)	Peripheral enthesopathies (n=259)	Joint disorder (n=467)	Back pain (n=650)	Neck pain (n=262)	Osteoarthritis (n=850)	Osteoporosis (n=113)	Inflammatory polyarthropathy (n=102)	Total (n=3,321)	Comparator group (n=3,068)
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Age group (yr)											
50–59	22 (35.5)	166 (29.9)	104 (40.2)	186 (39.8)	258 (39.7)	72 (27.5)	166 (19.5)	25 (22.1)	15 (14.7)	1,014 (30.5)	1,250 (40.7)
60–69	15 (24.2)	188 (33.8)	90 (34.7)	138 (29.6)	191 (29.4)	93 (35.5)	288 (33.9)	37 (32.7)	36 (35.3)	1,076 (32.4)	918 (29.9)
70–79	18 (29.0)	146 (26.3)	55 (21.2)	101 (21.6)	139 (21.4)	71 (27.1)	263 (30.9)	36 (31.9)	29 (28.4)	858 (25.8)	646 (21.1)
80+	7 (11.33)	56 (10.1)	10 (3.9)	42 (9.0)	62 (9.5)	26 (9.9)	133 (15.6)	15 (13.3)	22 (21.6)	373 (11.2)	254 (8.3)
Gender											
Male	18 (29.0)	239 (43.0)	131 (50.6)	187 (40.0)	316 (48.6)	118 (45.0)	306 (36.0)	15 (13.3)	33 (32.4)	1,363 (41.0)	1,462 (47.7)
Female	44 (71.0)	317 (57.0)	128 (49.4)	280 (60.0)	334 (51.4)	144 (55.0)	544 (64.0)	98 (86.7)	69 (67.6)	1,958 (59.0)	1,606 (52.3)
Deprivation status, categories											
1 (affluent)	17 (27.4)	138 (24.8)	68 (26.3)	99 (21.2)	155 (23.8)	73 (27.9)	227 (26.7)	33 (29.2)	21 (20.6)	831 (25.0)	840 (27.3)
2	15 (24.2)	111 (20.0)	74 (28.6)	127 (27.2)	160 (24.6)	66 (25.2)	233 (27.4)	28 (24.8)	24 (23.5)	838 (25.2)	842 (27.5)
3	15 (24.2)	148 (26.6)	58 (22.4)	131 (28.1)	166 (25.5)	61 (23.3)	178 (20.9)	31 (27.4)	39 (38.2)	827 (24.9)	714 (23.3)
4 (deprived)	15 (24.2)	159 (28.6)	59 (22.8)	110 (23.6)	169 (26.0)	62 (23.7)	212 (24.9)	21 (18.6)	18 (17.6)	825 (24.8)	671 (21.9)
Psychological status											
Good	37 (59.7)	307 (55.2)	169 (65.3)	260 (55.7)	353 (54.3)	126 (48.1)	425 (50.0)	47 (41.6)	44 (43.1)	1,768 (53.2)	1,933 (63.0)
Poor	25 (40.3)	249 (44.8)	90 (34.7)	207 (44.3)	297 (45.7)	136 (51.9)	425 (50.0)	66 (58.4)	58 (56.9)	1,553 (46.8)	1,134 (37.0)
Morbidity counts											
1	4 (6.5)	27 (4.9)	13 (5.0)	18 (3.9)	25 (3.8)	4 (1.5)	11 (1.3)	1 (0.9)	1 (1.0)	104 (3.1)	607 (19.8)
2–4	16 (25.8)	113 (20.3)	54 (20.8)	91 (19.5)	124 (19.1)	38 (14.5)	94 (11.1)	11 (9.7)	9 (8.8)	550 (16.6)	1,181 (38.5)
5–8	19 (30.6)	129 (23.2)	69 (26.6)	127 (27.2)	152 (23.4)	55 (21.0)	178 (20.9)	17 (15.0)	17 (16.7)	763 (23.0)	718 (23.4)
9–13	16 (25.8)	130 (23.4)	52 (20.1)	95 (20.3)	145 (22.3)	55 (21.0)	233 (27.4)	26 (23.0)	17 (16.7)	769 (23.2)	329 (10.7)
⩾14	7 (11.3)	157 (28.2)	71 (27.4)	136 (29.1)	204 (31.4)	110 (42.0)	334 (39.3)	58 (51.3)	58 (56.9)	1,135 (34.2)	233 (7.6)

Read code classifications used by family practitioners: N22 = soft tissue disorder; N24 = soft tissue pain; N21 = peripheral enthesopathies; N09 = joint disorder; N14 = back pain; N11 = neck pain; N05 = osteoarthritis; N33 = osteoporosis; N04/N20 = inflammatory polyarthropathy. The ‘‘comparator group’’ represents those without a study-specific (cardiovascular or musculoskeletal) Read code.

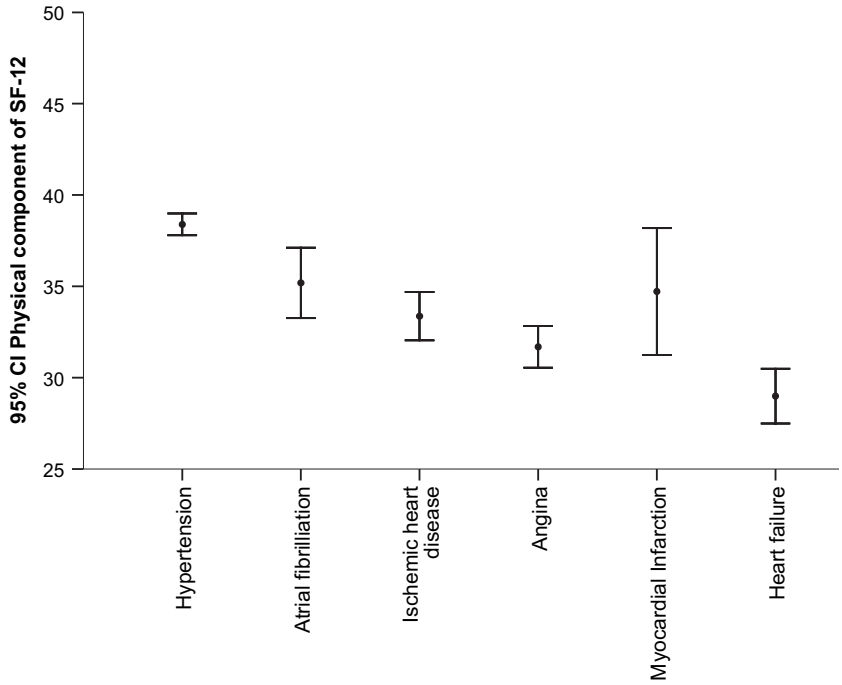

Fig. 1. Mean physical component summary score (95% CI) for cardiovascular disease group. CI, confidence interval; SF, short form.

musculoskeletal disorder group was 36.6 (SD: 12.2). Consulters with *hypertension* had a lower PCS score of 38.38 (95% CI: 37.8−39.0) than people who had consulted with symptoms of a *soft tissue disorder* with a score of 44.85 (95% CI: 42.2−47.5). For the hypothesized ''most severe'' categories, the PCS scores were 28.98 (95% CI: 27.4−30.4) for *heart failure* and 28.79 (95% CI: 26.7−30.8) for *inflammatory polyarthropathy*. Other diagnostic categories within both the spectrums also showed similar PCS scores; for example, *ischemic heart disease* (33.36 [95% CI: 32.0−34.7]) was comparable to *osteoarthritis* (33.15 [95% CI: 32.4−33.9]).

4. Discussion

Our study results confirm an *a priori* hypothesis that diagnostic labels applied in family practice can indicate the severity of physical health, within categories of cardiovascular disease and musculoskeletal disorder. Age, gender, deprivation and psychological status, and morbidity counts in a 2-year time period do not fully explain these associations. Although diagnostic variability exists in family practice [5,6], our results support the concept that groups of consulters with the same diagnostic label as recorded in clinical encounters could be grouped into exclusive measures of severity. Our findings for the selected cardiovascular disease labels showed that exclusive consulters with *heart failure* are most likely to have poorer physical health compared with *hypertension*-only consulters [26], and that consulters with an exclusive category of *angina* [27] will differ in health severity compared with *atrial fibrillation* consulters [28]. All those with a cardiovascular diagnostic category had poorer physical health than the study comparator group [29]. Although we selected only six diagnostic categories for cardiovascular disease, they were based on potentially illustrating the idea that the different categories convey the stages of disease pathology development in populations [30,31].

Our findings for the selected musculoskeletal disorders showed that consulters with exclusive *inflammatory polyarthropathy* have poorer physical health compared with those who consult for the symptoms of *soft tissue disorders* [32]. All musculoskeletal diagnostic categories, except soft tissue disorders, had poorer physical health than the comparator group. In the musculoskeletal group, there were nine separate categories, and they had been selected on the basis of potentially illustrating the idea that different categories convey a spectrum of severity disorders that may be interrelated in populations. So our categories related to nonspecific (*soft tissue disorder and soft tissue pain*) and specific regional symptoms (*peripheral enthesopathies*, *joint disorders*, *back pain*, *and neck pain*) and pathology (*osteoarthritis*, *osteoporosis*, *and inflammatory polyarthropathy*). It is possible, for example, that our exclusive consulters with *osteoarthritis* may include people who also had a *joint disorder* diagnosis [33] or that *neck pain* may be part of the symptom complex of *inflammatory polyarthropathy* [34]. In contrast to the hypothesis for the clear pathological links between different cardiovascular diseases, here the hypothesis is related to undifferentiated and differentiated stages of illness within the same

Table 3
Associations between diagnostic categories and poor physical health by cardiovascular disease and musculoskeletal disorder groups

Diagnostic category	Total number[a]	Exclusive number[b] (%)	Physical health[c] Good	Poor	Unadjusted OR (95% CI)	Adjusted OR (95% CI) Age, gender, and deprivation status[d]	Age, gender, deprivation status,[d] and MCS[e]	Age, gender, deprivation status,[d] MCS,[e] and morbidity count[f]
Cardiovascular disease								
Hypertension	1,824	1,606 (88.0)	736	870	1.0[g]	1.0[g]	1.0[g]	1.0[g]
Atrial fibrillation	168	115 (68.5)	37	78	1.78 (1.1–2.6)	1.63 (1.1–2.5)	1.55 (1.0–2.4)	1.51 (1.0–2.3)
Ischemic heart disease	357	257 (72.0)	64	193	2.55 (1.8–3.4)	2.78 (2.0–3.8)	2.74 (2.0–3.8)	2.98 (2.1–4.1)
Angina	327	286 (87.5)	55	231	3.55 (2.6–4.8)	3.62 (2.6–5.0)	3.30 (2.4–4.6)	3.18 (2.3–4.4)
Myocardial infarction	50	44 (88.0)	11	33	2.53 (1.2–5.0)	3.17 (1.6–6.4)	3.02 (1.5–6.3)	2.81 (1.3–6.0)
Heart failure	139	139 (100.0)	17	122	6.07 (3.6–10.1)	5.02 (3.0–8.5)	4.35 (2.5–7.5)	3.54 (2.1–6.1)
Musculoskeletal disorder								
Soft tissue disorder	119	62 (52.1)	43	19	1.0[g]	1.0[g]	1.0[g]	1.0[g]
Soft tissue pain	1,119	556 (49.7)	251	305	2.75 (1.6–4.8)	2.91 (1.6–5.2)	2.97 (1.6–5.5)	2.62 (1.4–4.9)
Peripheral enthesopathies	462	259 (56.1)	152	107	1.59 (0.9–2.9)	1.95 (1.1–3.6)	2.11 (1.1–4.0)	1.79 (0.9–3.4)
Joint disorder	836	467 (55.9)	214	253	2.67 (1.5–4.7)	3.09 (1.7–5.6)	3.17 (1.7–5.8)	2.73 (1.5–5.1)
Back pain	876	650 (74.2)	279	371	3.00 (1.7–5.3)	3.47 (1.9–6.2)	3.53 (1.9–6.5)	2.99 (1.6–5.5)
Neck pain	325	262 (80.6)	89	173	4.39 (2.4–8.0)	4.95 (2.7–9.2)	4.77 (2.5–9.1)	3.76 (2.0–7.2)
Osteoarthritis	882	850 (96.4)	218	632	6.56 (3.7–11.5)	6.74 (3.8–12.1)	6.86 (3.8–12.5)	5.38 (2.9–9.9)
Osteoporosis	118	113 (95.8)	27	86	7.20 (3.6–14.4)	7.77 (3.8–15.9)	7.34 (3.5–15.3)	5.34 (2.5–11.3)
Inflammatory polyarthropathy	102	102 (100.0)	14	88	14.22 (6.5–31.1)	13.90 (6.2–31.0)	13.37 (5.9–30.4)	9.77 (4.2–22.5)

Abbreviations: OR, odds ratio; CI, confidence interval; MCS, mental component summary; SF, short form.
[a] Number of patients in the study sample with at least one morbidity consultation for this diagnostic category in the 2-year time period of observation.
[b] Number of patients classified by study-defined exclusive severity categories.
[c] Based on physical component summary score from SF-12.
[d] Deprivation score as measured by Index of Multiple Deprivation [24].
[e] Based on MCS score from SF-12.
[f] Morbidity count is the number of different morbidities consulted for in a 2-year period before health survey.
[g] Reference group.

spectrum of musculoskeletal disorders. So, although there were distinct hypotheses for the two examples chosen, the study findings are consistent in reflecting the overall idea that diagnostic labels can act as a measure of the corresponding physical health severity. Such empirical findings from a large population-based study of family practice provide the basis for clinical construction of populations with relatively poor physical health, the implication being that this may aid clinical management [35]. Potential benefits may include an improved ability for the FP to provide more selective or staged treatment referral mechanisms depending on the label or developing management approaches that use information from diagnostic labels as proxy measures of general physical health. This method may also provide the basis of an epidemiological construction of the stages of disease that populations may develop and pass through over time.

Although specific examples were chosen for the study, the analyses allowed the comparison of physical health for consulters with different, but exclusive, diagnostic categories between the disease and disorder spectrums [36,37]. Consulters with *angina* or *heart failure* have comparable poor health to consulters with *osteoarthritis, osteoporosis*, or *inflammatory polyarthropathy*. Consulters for *osteoarthritis* have poorer physical health than consulters with *back pain* [32]. Age, gender, and deprivation and psychological status do not explain these associations, and even the co-occurrence of other morbidity did not explain the associations between diagnostic categories and severity as measured by self-reported physical health.

The interpretation of study results is based on the notion of severity that relates to the *population* of consulters with a diagnostic category, for example, of either *angina* or *osteoarthritis*. Previous evidence has highlighted that there is variation in the diagnostic coding by family physicians in primary care [5,38]. However, this study provides the evidence that the clinical judgment that underpins the application of diagnostic labels (and arguably the decision-making process), at least at a population level can distinguish between different severities of physical health.

Because the study measurement is also based on the consulting population, it will not include people who had one of the study conditions but did not consult during the study period. However, with a 2-year time window of observation, our study would have captured most of the study conditions, which are persistent and chronic in duration. Our study was also based on people who had agreed to participate in the health survey, consented to the record review and had consulted, which introduces the possibility of other selection issues [39–41]. However, overall response to the

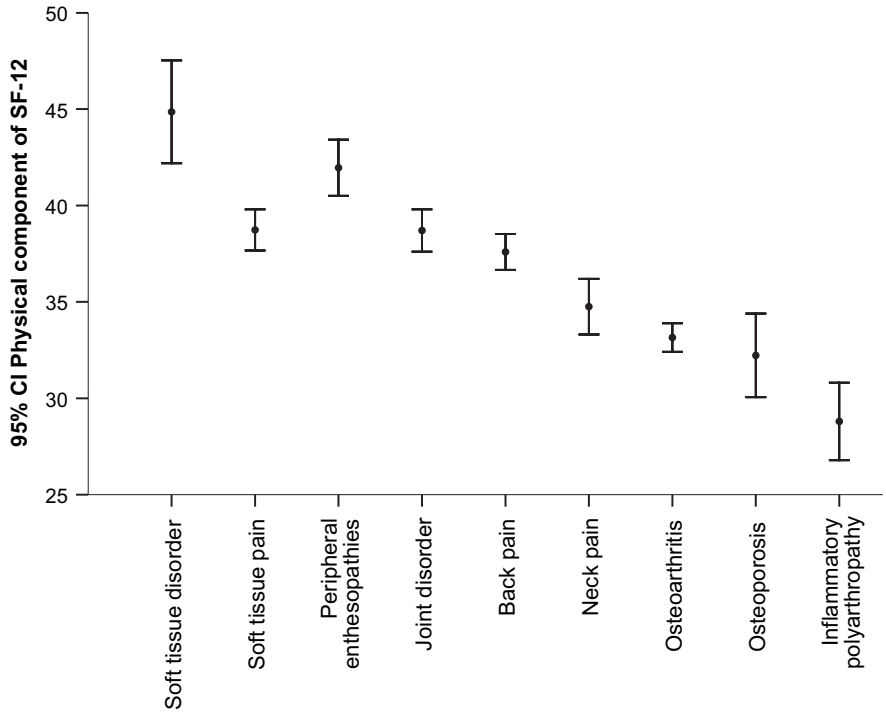

Fig. 2. Mean physical component summary score (95% CI) for musculoskeletal disorder group. CI, confidence interval; SF, short form.

survey was high (68.9%), and our previous analyses have shown that such a bias is unlikely [42] (see Table 1 on the journal's Web site at www.elsevier.com). Internal comparisons remain valid as they were based on *a priori* hypotheses, and although the use of "exclusive" groups categorized patients by their most severe consultation, the adjustment by morbidity counts reduces the explanation of comorbidity as a marker of poor physical health. Finally, other cardiovascular and musculoskeletal conditions could have been chosen, but study categories were based on previous work, although other diagnostic categories may require further validation against physical health measures.

In conclusion, using the examples of cardiovascular disease and musculoskeletal disorders, our study shows that exclusive diagnostic labels can be used as a basis of indicating severity as measured by physical health. These findings were not explained by sociodemographic factors or comorbidity. In family practice populations, this method provides the evidence for using diagnostic labels as a basis for developing clinical decision aids for the potential provision of public health interventions and for the epidemiological investigation of change in chronic disease or disorder over time.

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Appendix

Supplementary material

Supplementary material can be found, in the online version, at 10.1016/j.jclinepi.2010.06.002.

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